MASTER
MASTER SOLAR ENERGY LIMITED
Registered Office: Master House,54 Dar-ul-Aman Cooperative Housing Society, Shahrah-e-Faisal, Karachi.
Lahore Office: 82-C-1, Gulberg III, Lahore.
TEL: +92-42-35752684 **FAX:** +92-42-35752685

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 for 100 MW Solar Power Plant at Bela, Lasbela District, Balochistan

I, Rumman Arshad Dar, Chief Operating Officer, being the duly authorized representative of Master Solar Energy Limited by virtue of Board Resolution dated March 28, 2025, hereby apply to the National Electric Power Regulatory Authority for the grant of a Generation License to Master Solar Energy 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 in the sum of PKR 1,375,086/- (Pakistani Rupees One Million Three Hundred Seventy Five Thousand and Eighty Six only), being 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.

Signature: _____
Name: Rumman Arshad Dar
Designation: Chief Operating Officer

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CHECK LIST FOR EXAMINATION OF CONCURRENCE APPLICATION FOR RENEWABLE POWER PROJECT

(Regulation 3 read with 3(4)(A) of AMECPR-2021)

Name of Company: Master Solar Energy Limited

Installed Capacity: 100 MW

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

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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;	Annexure F
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 led by Master Textile Mills Limited (the **"MTML Consortium"**). Indicative term sheets from prospective financiers were submitted by the MTML Consortium as part of its bid submission. BER has been duly approved by NEPRA pursuant to the BER Approval.
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 MTML Consortium as part of the pre-qualification criteria assessment. BER has been duly approved by NEPRA pursuant to the BER Approval.

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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 sub-contractors were submitted by the MTML 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 MTML 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

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Regulation #	Information/Documents Required	Information/ Documents Submitted
3(f) *	Feasibility Study	Feasibility Study report submitted by 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 simultaneously applied for a generation license for both 50 MW Winder and 100 MW Bela Projects. 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 Master Solar Energy 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	Annexure H
2.	Environmental Impact Assessment Study	Environmental Impact Assessment Study has been submitted by KE as part of the RFP package.

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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

BEFORE
THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
(NEPRA)

APPLICATION FOR A GENERATION LICENSE / REGISTRATION FOR SOLAR 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

MASTER SOLAR ENERGY LIMITED

(A SPECIAL PURPOSE VEHICLE INCORPORATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE LAWS BY MASTER TEXTILE MILLS LIMITED/CONSORTIUM AS REQUIRED BY THE NEPRA APPROVED RFP)

FOR NEPRA'S GRANT OF GENERATION LICENSE / REGISTRATION FOR MASTER SOLAR ENERGY LIMITED

FOR POWER PROJECT OF TOTAL 100 MW

AT

BELA, DISTRICT LASBELA, PROVINCE OF BALOCHISTAN, PAKISTAN

DATED: April 07, 2025

MASTER SOLAR ENERGY LIMITED
MAILING ADDRESS : 82-C-I, GULBERG III, LAHORE, PAKISTAN
PHONE # : +92-42-35752683-84
FAX # : +92-42-35752685
EMAIL : DEV-TEAM@MASTERWIND.COM.PK

APPLICATION FOR GENERATION LICENSE

CHECKLIST FOR EXAMINATION OF LICENSE APPLICATION FOR RENEWABLE POWER PROJECT

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STATEMENT OF AUTHORIZED REPRESENTATIVE OF MASTER SOLAR ENERGY LIMITED

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W505149

E-STAMP

0085-30193786

PB-LHR-4032C162512[illegible]5

Non-Judicial

Rs 500/-

Description	: AGREEMENT OR MEMORANDUM OF AN AGREEMENT - 5(d)
First Party	: Master Solar Energy Limited [3000000000000]
Second Party	: NEPRA [3000000000000]
Agent	: Faheem Raza [35201-7699217-7]
Stamp Duty Paid by	: Master Solar Energy Limited [3000000000000]
Issue Date	: 28-Mar-2025, 10:18:47 AM
Paid Through Challan	: 20253DEA19FFD777
Amount in Words	: Five Hundred Rupees Only

Please Write Below This Line

AFFIDAVIT

BEFORE

THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

I, Rumman Arshad Dar S/o Arshad Iqbal Dar, CNIC No. 61101-1927558-5, Chief Operating Officer, Master Solar Energy Limited hereby solemnly affirm and declare on oath that the contents of the accompanying application for the Generation License / Registration of Master Solar Energy Limited, including all attached documents-in-support, are true and correct to the best of my knowledge and belief, 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 and declare on oath that Master Solar Energy Limited was notified as the lowest bidder by KE for 50 MW Winder project and 100 MW Bela project. Master Solar Energy Limited has simultaneously applied for a generation license for 50 MW Winder project and 100 MW Bela project. No other license under the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997, has currently been granted to Master Solar Energy Limited.

DEPONENT

Verification

Verified on oath at Lahore, Pakistan on this 07 day of April 2025, that the contents of the above affidavit are true and correct to the best of my knowledge and belief.

DEPONENT

MASTER
MASTER SOLAR ENERGY LIMITED
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Lahore Office: 82-C-1, Gulberg III, Lahore.
TEL: +92-42-35752684 **FAX:** +92-42-35752685

CERTIFIED TRUE COPY OF THE MINUTES OF THE MEETING OF THE BOARD OF DIRECTORS OF MASTER SOLAR ENERGY LIMITED HELD AT ITS REGISTERED OFFICE 54 DARUL AMAN COOPERATIVE HOUSING SOCIETY, MAIN SHAHRAH E FAISAL, KARACHI ON MARCH 28, 2025

We hereby certify that the following resolutions of the Board of Directors of Master Solar Energy Limited (the **"Company"**) were passed on March 28, 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 projects comprising of the 100 MW solar photovoltaic power project located in Bela, Lasbela District, Balochistan and the 50 MW solar photovoltaic power project located in Winder, Lasbela District, Balochistan (the "**Projects**") 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. Rumman Arshad Dar S/o Arshad Iqbal Dar having CINC # 6110-1927558-5, is hereby authorized and empowered to undertake 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.

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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 aforestated 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.

"

I, the undesigned, 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.

CERTIFIED TO BE TRUE COPY

Company Secretary

Amir Mushtaq Butt

Master Solar Energy Limited

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COPY OF BANK DRAFT

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1. BACKGROUND OF GENERATION LICENSE APPLICATION

1.1 PROCESS LEADING TO GENERATION LICENSE APPLICATION

1.1.1 MASTER SOLAR ENERGY LIMITED (a company duly organized and existing under the laws of Pakistan, with its registered office located at 54 Darul Aman Cooperative Housing Society, Main Shahrah e Faisal, Karachi, Pakistan) , being the SPV formed by MTML 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 July 31, 2024 to K-Electric Limited (**"KE"**) in response to the invitation to bid circulated by KE (the **"RFP"**), to develop and establish a solar project with a total capacity of 100 MW (the **"Project"**) located at Bela, Lasbela District, Balochistan, Pakistan (the **"Project Site"**).

1.1.2 The Project Company is the lowest evaluated bidder for two (02) solar power projects: (a) the Project Site; and (b) 50 MW Winder Solar Power Project.

1.1.3. KE submitted the Bid Evaluation Report (the **"BER"**) for the Project to the National Electric Power Regulatory Authority (**"NEPRA"**) on August 28, 2024. The BER is attached herein as Annexure J. NEPRA communicated to KE its approval of the BER through an email dated March 25, 2025, which was further communicated to the Project Company through an email dated March 27, 2025 (the **"BER Approval"**), attached herein as Annexure K. Pursuant to the letter dated August 23, 2024, bearing reference no. BD/SQK/MT-WBB/01/2024-2308, KE informed Master Textile Mills Limited (**"MTML"**) that MTML has successfully cleared the technical evaluation and submitted the lowest bid tariff for the Project (the "**KE Letter**") (attached as Annexure M).

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** the 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 RE Policy 2006 and the ARE

RND

Policy 2019: **MASTER SOLAR ENERGY LIMITED,** being the SPV formed by MTML Consortium being acknowledged as having submitted the lowest bid tariff under the KE Letter for the purpose of this Project **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 **MASTER SOLAR ENERGY LIMITED** for the Project having a total capacity of 100MW, to be located at Bela, Lasbela District, Balochistan, Pakistan.

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 1,375,086/- (Pakistani Rupees One Million Three Hundred Seventy-Five Thousand and Eighty-Six only) dated April 04, 2025 in favor of NEPRA.

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2. APPLICANT – MASTER SOLAR ENERGY LIMITED

2.1 The Project Company, being the applicant under this Generation License Application, is a public 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 a 100 MW solar power generation facility (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 Original Equipment Manufacturers (**"OEM"**) and a Civil Construction Contractor. The profile of the aforementioned suppliers/contractors has been submitted by the MTML 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 Manual	ANNEXURE L
K-Electric letter to Master Textile Mills Limited (**"MTML"**)	ANNEXURE M

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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 (the **"GL"**) to the Project Company.

4. RESOURCES

4.1 SENIOR MANAGEMENT & PERSONNEL

4.1.1 The Project Company has access to and has engaged the highly qualified personnel (together with a team of reputable technical, legal and in-house financial advisory team) for the development of the Project. The Project Company is presently under process of enhancing its personnel to further strengthen its team based on the requirements of the Project.

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. Nadeem Malik	DIRECTOR	G
2.	Mr. Najeeb Malik	DIRECTOR	G
3.	Mr. Shahzad Malik	DIRECTOR	G
4.	Mr. Rumman Arshad Dar	CHIEF OPERATING OFFICER	G
5.	Mr. Syed Shahzad Ali	GENERAL MANAGER PLANT OPERATIONS	G
6.	Mr. Gohar Qudoos	SENIOR MANAGER PLANT	G
7.	Mr. Rashid Hussain Bhatti	SENIOR MANAGER PLANT	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. For details on the O&M Plan, please refer to the Annexure L attached herewith.

4.3 TECHNICAL ADVISERS

4.3.1 Renewable Resources (**"RE2"**) has been involved with the renewable energy sector in Pakistan since its inception and has been appointed by the Project Company as one of its technical advisors. RE2 is currently advising a number of solar projects developers and has extensive experience in power plant design, project development, and construction. RE2 focuses on delivering efficient, cost effective and environmentally friendly energy solutions, particularly in wind and solar power, where it holds a significant market share in Pakistan. Their

services include resource assessment, technology selection, feasibility studies, and regulatory compliance, supporting clients across all phases of renewable energy projects from inception to commissioning of the Project. With RE2 on the side of the Project Company, the Project is best positioned for the avoidance of technical risks.

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 solar. This selection is based upon the detailed technical requirements laid out in Section 15 of the RFP provided by KE. Various factors were considered in selection of equipment and technology which included:

(a) equipment to be of latest proven technology, megawatt class and high efficiency;

(b) safe transportation of equipment to the solar plant 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 ACHIEVED[1]	
ACTIVITIES	**ANTICIPATED COMPLETION DATE**
Submission of Performance Guarantee by Project Company	Prior to the issuance of Letter of Intent (**"LOI"**) by KE and within 10 business days after being declared as the successful bidder
Issuance of LOI	Upon NEPRA's notification of BER approval
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 Balochistan	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	10 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.

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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.

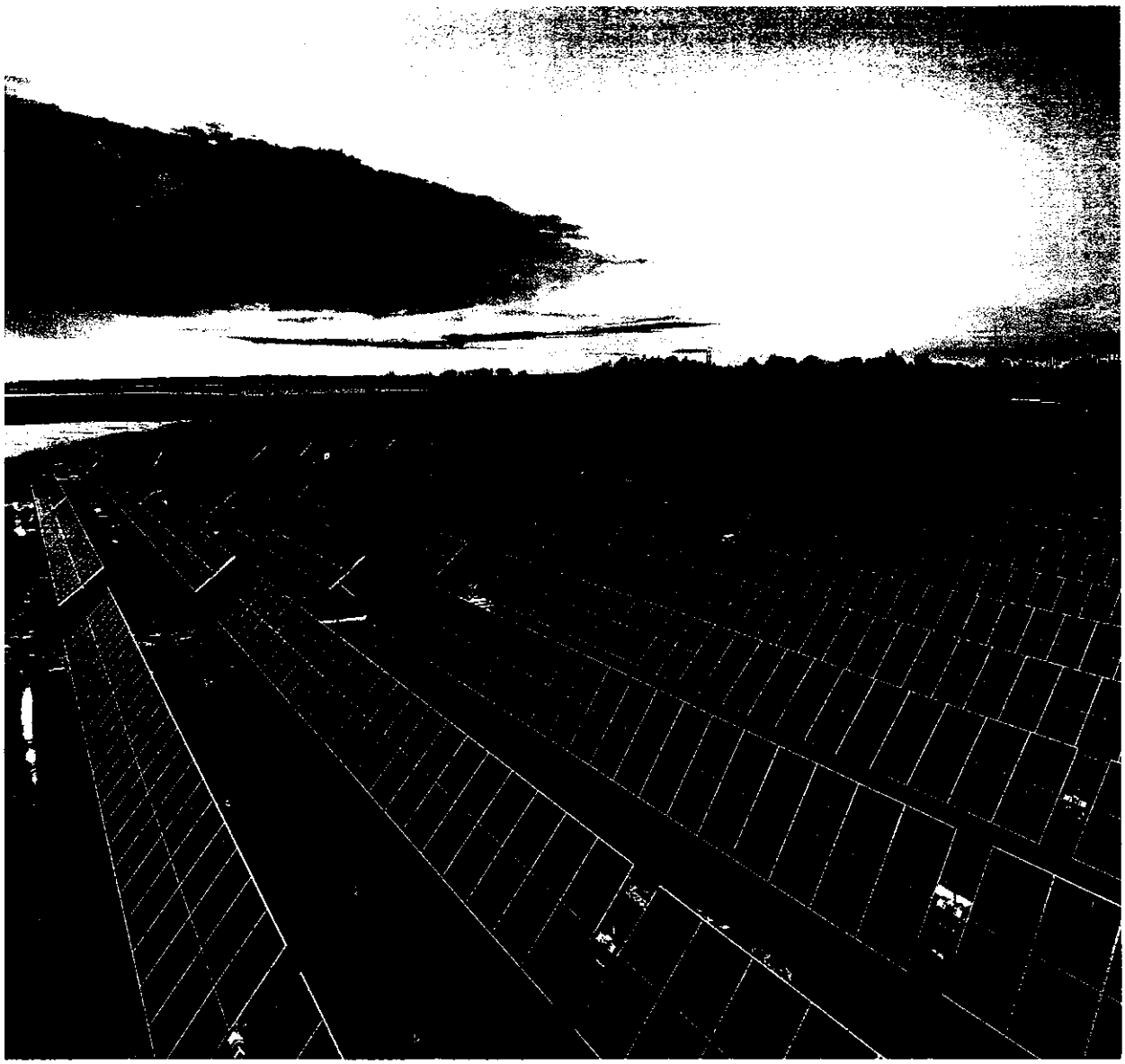
Respectfully submitted for and on behalf of:
MASTER SOLAR ENERGY LIMITED

.....

MR. RUMMAN ARSHAD DAR
(CHIEF OPERATING OFFICER)

Master Solar Energy Limited

ANNEXURE – A
PROSPECTUS



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MASTER SOLAR ENERGY LIMITED

MASTER SOLAR ENERGY LIMITED

150 MW WINDER AND BELA SOLAR POWER PROJECTS

RPD

Executive Summary

Project Name	Winder and Bela Solar Power Projects	
Project Company	Master Solar Energy Limited ("**MSEL**")	
Main Sponsors	Master Group of Industries	
Industry	Power Sector – Solar Farm	
	Bela	**Winder**
Project Capacity	100MW	50MW
Location	Bela, Lasbela District, Balochistan	Winder, Lasbela District, Balochistan
Land Area	500 acres	250 acres
Bid Tariff	PKR 11.2071/kWh	PKR 11.6508/kWh
Land Lease	Government of Balochistan through Balochistan Energy Company Limited	
Construction Period	10 months from financial close	
Concession Period	25 years from Commercial Operations Date ("**COD**")	
Power Purchaser	K-Electric	

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Pakistan's Energy Sector

The proportion of imported fuel-based power plants in Pakistan's total generation mix has steadily increased over the last two decades. This has resulted in a growing dependence on imported fuels, exposing the cost of electricity generation to fluctuations in foreign exchange rates. Currently, thermal plants account for approximately 60% of the country's total installed capacity[1].

The surge in the cost of imported fuels, particularly following the Russia-Ukraine war and the COVID-19 pandemic, has led to a notable increase in the fuel cost component of power plant tariffs in Pakistan. As a result, power plants are facing higher fuel procurement costs, which directly impact their overall generation expenses. This increase in generation costs has, in turn, led to higher electricity tariffs, putting added pressure on both consumers and the broader economy.

Simultaneously, the foreign exchange rate of PKR to USD reached an all-time high crossing the PKR 300 / USD mark for the first time in history. The interconnectedness of fuel prices and exchange rate fluctuations underscores the vulnerability of the energy sector to global economic shifts, highlighting the importance of macroeconomic stability in managing the cost of electricity production.

With the rising challenges faced by the power sector in Pakistan, the policy makers are now inclined to diversify the Country's energy mix, moving away from thermal dependency towards cleaner sources like solar, wind, and hydel. As of June 2024[2], the installed capacity reached **45,888 MW**, with renewables playing an increasing role at **6.24%**. The breakdown of installed capacity and its changes over the past year, as shown below, highlights the country's growing focus on renewable energy, the only source that has seen an increase in installed capacity.

Source	June 2023 (MW)	June 2024 (MW)	(%) Share
Hydel	10,635	10,635	23.17%
Thermal	28,766	28,766	62.68%
Nuclear	3,620	3,620	7.88%
Renewable	2,717	2,867	6.24%
Total	**45,738**	**45,888**	**100%**

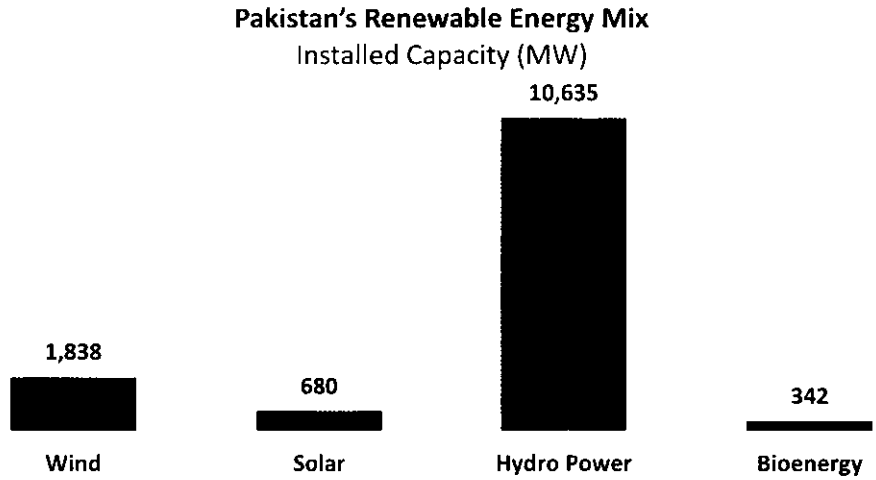
Table 1 NEPRA State of Industry Report 2024

[1] Ministry of Energy (Power Division) – Government of Pakistan
[2] NEPRA State of Industry Report 2024

RAV

In recent years, Pakistan has introduced policies to bolster renewable energy development. Over the past decade, solar and wind power have emerged as the fastest-growing segments in the energy mix. As part of its Nationally Determined Contributions, Pakistan targets 30% of its electricity generation from renewable sources by 2030[3].

Pakistan is actively working to meet its growing energy demands while reducing greenhouse gas emissions. The Government of Pakistan ("**GoP**") is prioritizing large-scale renewable energy investments to advance its clean energy objectives. With a target to cut greenhouse gas emissions by 50% by 2030, expanding clean energy will be pivotal in achieving this goal. To support these efforts, the GoP has established a wind energy corridor along the southern coastal regions of Sindh and Balochistan.



Source: Private Power and Infrastructure Board

Solar Power

The geographic location of Pakistan is an added bonus for solar technology as the country is located at an aerial belt that receives a large volume of daylight which can produce around ***95% energy during daylight hours*** (8 to 9.5 hours per day)[4]. Over 95% of the sovereign state of Pakistan has a global average solar radiation of 5-7 kWh/m2/day. The sun shines for above 2300-2700 hours a year in the south-western province of Balochistan and the north-eastern region of Sindh and Southern Punjab. According to Alternate Energy Development Board (AEDB), Pakistan has the potential to generate around 2.9 TW of solar power. The development of solar power resource in Pakistan will therefore allow for an influx of cheap, clean energy into the national grid, and represents one of the best energy options for Pakistan.

[3] Ministry of Energy (Power Division) – Government of Pakistan

[4] NEPRA State Industry Report 2024

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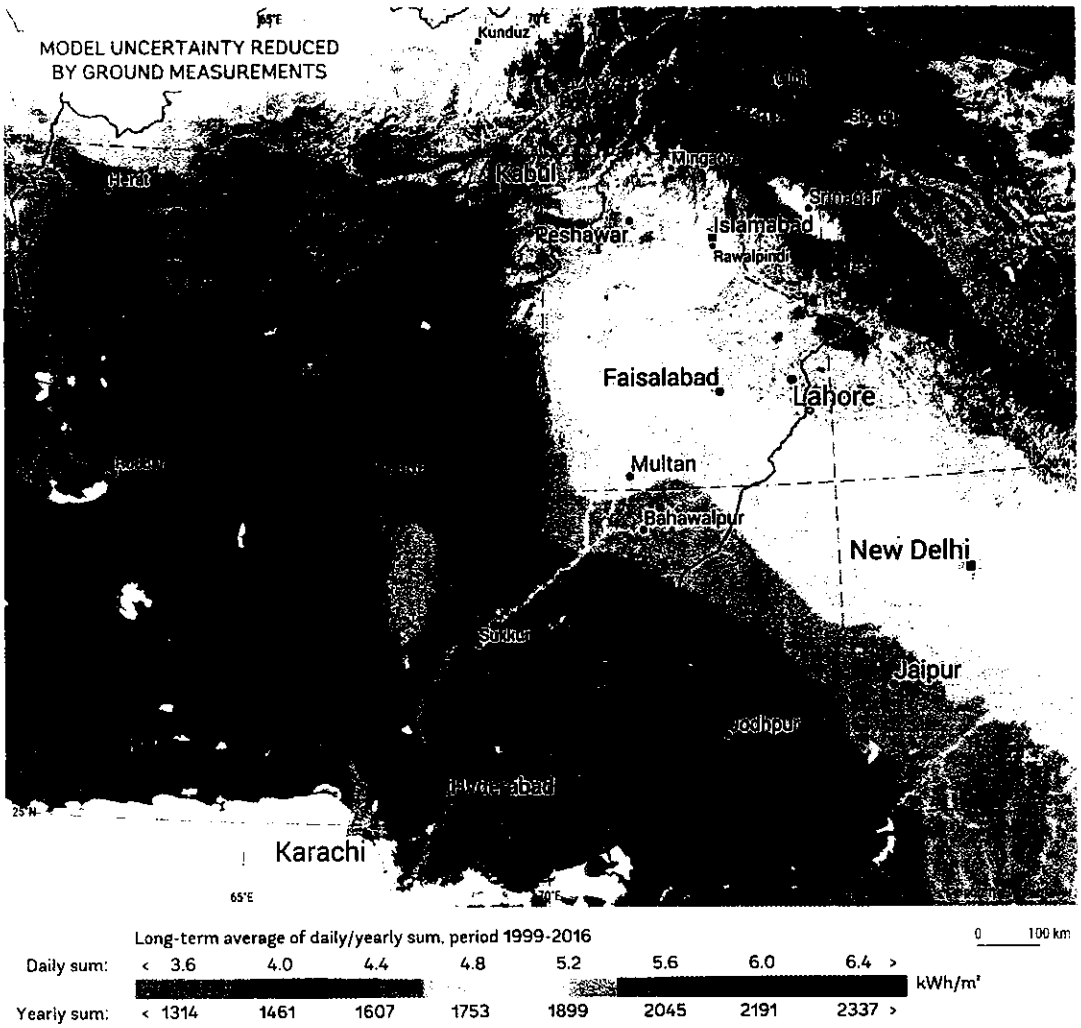
The Projects will be situated in the Balochistan province of Pakistan, which is the largest province of Pakistan in terms of area and is bounded by Afghanistan in the west, Khyber Pakhtunkhwa in the north, Sindh province in the south and Punjab province in the east.

Based on a World Bank study, the resource potential of Balochistan is the highest in the Country. Around 40% of the land area of Balochistan receives direct solar insolation with an energy potential of more than 6 kWh per square meter per day, while the rest of the province receives direct solar radiation with an energy potential of 4.5 kWh per square meter per day. Simple extrapolation from these numbers yields a total power generation potential of as much as 1.2 million MW. Vast majority of land in the area is barren, making it an ideal site for putting up solar panels. This solar potential in the province of Balochistan is to date untapped, with no solar projects located in the region as of today.

The Projects are hence strategically positioned to capitalize on the city's expanding infrastructure and connectivity. With the completion of major projects like integration into the China-Pakistan Economic Corridor (CPEC), Balochistan is poised for exponential growth and increased demand for electricity.



Source: World Bank Solar GIS map

RAD

Master Solar Energy Limited – 150 MW Winder and Bela Solar Power Plants

Project Profile

K-Electric is a public 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 license for Karachi and its adjoining areas including Dhabeji and Gharo in Sindh and Hub, Uthal, Winder and Bela in Balochistan.

KE, in line with its vision to increase share of renewables to 30%, plans to add 1,282 MW of renewable capacity by way of competitive bidding, with an addition of 640 MW in Phase I and 642 MW in Phase II. KE conducted the initial prequalification process for development of 3x50 MW solar power projects in District Uthal, Winder and Bela, Balochistan in 2021. These projects were later re-classified as two (02) solar power projects: (a) 100 MW Bela Solar Power Project; and (b) 50 MW Winder Solar Power Project, in District Winder and Bela (the "**Projects**"). Post issuance of the NEPRA Determination by the Authority, KE issued the RFP and invited interested parties to submit bids for development of solar power projects in Winder and Bela, Lasbela District, Balochistan.

Master Group of Industries (MGI) submitted its bid to KE and was declared as the lowest bidder by K-Electric. The Projects will be developed by MGIs Special Purpose Vehicle ("**SPV**") namely Master Solar Energy Limited. The Projects will sell electricity to KE under the Energy Purchase Agreement to be entered for a term of 25 years.

The Winder and Bela towns are located in the Lasbela district of Balochistan which fall under KE's distribution territory with an existing transmission network from Winder to Bela of 66 kV which is planned to be replaced with new transmission lines and grids of 132 kV. The 132 kV transmission system is planned to be energised before each Project's COD.

Land will be allocated to the Project by the Government of Balochistan ("**GOB**") through its wholly owned subsidiary Balochistan Energy Company Limited ("**BECL**").

Shareholder Profile

MSEL is sponsored by Master Group of Industries. Brief profile of the Sponsor is given below.

Master Group

Master Group of Industries ("**MGI**" or the "**Group**") is one of the most dynamic and diverse business conglomerates in Pakistan. The Group started its operations in the foam industry in 1963, as a licensee of Bayer A.G. (Germany). Since then, Group has expanded into the textile, automobile, engineering and energy sectors and tasked itself to become a leading group of Pakistan that actively contributes to every industry with its innovative solutions and exceptional products and services. MGI has a committed workforce of over 18,000 employees that enable it to innovate, evolve, and transform trends. Be it

RAD

automotive or home furnishing, wind energy or bedding, furniture or healthcare, textile or chemicals, Master Group has excelled with its inventive and futuristic approach.

The Group's vision is to promote prosperity in Pakistan, which it is doing by not only creating employment opportunities in the Country but also through renewable energy projects; producing 102.50-megawatt renewable electricity by wind and solar combined — simultaneously assisting in preserving the environment. At present the Group is producing 4 times more renewable energy than it consumes, making it a carbon-negative organisation.

MGI is one of the key players of the renewable energy sector in Pakistan and is highly committed to partake in its growth in order for Pakistan to achieve energy security, reduce reliance on imported fuel and reach a lower energy basket price. The Group forayed into the renewable energy sector with its first 52.80 MW wind power project namely Master Wind Energy Limited situated in District Jhimpir, Sindh, which achieved commercial operations date in October, 2016. Following the successful commencement of operations of Master Wind, the Group ventured into its second 50 MW wind power project Master Green Energy Limited located in District Jamshoro, Sindh, which achieved commercial operations date in August, 2021. MGI has also been declared as the First Ranked Bidder for development of a 99 MW Arkari GoI hydropower project in District Chitral, Khyber Pakhtunkhwa by Pakhtunkhwa Energy Development Organisation ("**PEDO**") and has been issued a Letter of Intent for development of a 50 MW wind power project Jamshed Wind Energy in District Jhimpir, Sindh, by the Directorate of Alternative Energy Department Government of Sindh ("**DAE-GOS**").

In line with the Government of Pakistan's ("**GOP**") vision to increase the renewable energy share in the Country's energy mix, MGI participated in the Competitive Bidding held for the Project, and submitted the lowest evaluated bid. The Group is eager to contribute meaningfully to Pakistan's energy security by advancing these transformative Projects, which aim to harness the region's renewable energy potential. Furthermore, MGI is deeply committed to supporting the socio-economic development of Balochistan, addressing its unique challenges, and fostering long-term prosperity in the area through job creation, infrastructure development, and access to clean energy.

Project Consultants

I. Technical Consultant – Renewable Resources (RE2) is the professional technical advisor for the Project. **RENEWABLE RESOURCES (PRIVATE) LIMITED (RE2),** has been involved with the renewable energy sector in Pakistan since its inception and has been appointed by the Project Company as one of its technical advisors. RE2 is currently advising a number of solar projects developers and has extensive experience in power plant design, project development, and construction. RE2 focuses on delivering efficient, cost effective and environmentally friendly energy solutions, particularly in wind and solar power, where it holds a significant market share in Pakistan. Their services include resource assessment, technology selection, feasibility studies, and regulatory compliance, supporting clients across all phases of renewable energy projects from inception to commissioning of the Project.

II. Legal Consultant – **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

RAD

financing matters. Haidermota & Co., has been actively involved in the power sector projects and has advised various project companies / sponsors, lenders and the GOP 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.

Environmental Impact of the Project

The proposed facility is a solar power generation plant and does not release emissions or harmful pollutants into the atmosphere. On the whole, solar power projects benefit the environment as they reduce the requirement for fossil fuel based thermal power stations. The site for the Project is a barren region with little or no vegetation and few inhabitants.

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ANNEXURE – B
CERTIFICATE OF INCORPORATION

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A009395

SECP

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

COMPANY REGISTRATION OFFICE, LAHORE

CERTIFICATE OF INCORPORATION

[Under section 32 of the Companies Ordinance, 1984 (XLVII of 1984)]

Corporate Universal Identification No.**0093653**

I hereby certify that **MASTER SOLAR ENERGY LIMITED** is this day incorporated under the Companies Ordinance, 1984 (XLVII of 1984) and that the company is **Limited by Shares.**

Given under my hand at **Lahore** this **Twenty Eighth** day of **May,** Two **Thousand** and **Fifteen**.

Fee Rs.104,000/-

CERTIFIED TO BE TRUE COPY
28/06/2015
JOINT REGISTRAR OF COMPANIES
COMPANY REGISTRATION OFFICE
LAHORE

(LIAQAT ALI DOLLA)
Additional Registrar

No.ARL/ 29825 DATED: 28/5/2015

ANNEXURE – C
MEMORANDUM AND ARTICLES OF ASSOCIATION

RND

PUBLIC COMPANY LIMITED BY SHARES

INCORPORATED UNDER THE COMPANIES ORDINANCE, 1984

MEMORANDUM OF ASSOCIATION

MASTER SOLAR ENERGY LIMITED

NAME

I. The name of the Company is "MASTER SOLAR ENERGY LIMITED".

REGISTERED OFFICE

II. The Registered Office of the Company will be situated in the Province of the **Sindh.**

OBJECTS

III. The objects for which the Company is established are all or any of the following :

1. To carry on the business of electric power supply company and to conduct, lay down, establish, fix and out all necessary power stations, cables, wires, lines, accumulators, lamps and works, and to set up, operate Solar power generation projects to generate, accumulate, distribute and supply electricity and light to sister concern companies branches, W.A.P.D.A., K.E.S.C., industries, cities, towns, streets, docks, markets, theatres, buildings and places both public and private subject to permission from NEPRA.

2. To carry out the construction of Solar, gas, hydroelectric and thermal energy projects fueled by various fuels such as solar energy, gas energy, bio –thermal energy and to construct, establish and fix necessary power stations.

3. To carry on the business of establishing operating and managing transmission systems for electricity generation, steam process, air and suppliers of and dealers in electrical and related appliances, generators, cables, wire lines, dry cells, accumulators lamps and works and to generate, accumulate, distribute and supply electricity for the purpose of light, heat, motive power, and for all other purposes for which electrical energy can be employed.

4. To import, purchase, supply and acquire all kinds of raw and other materials for generation of energy electricity and sell, transmit and deliver the same thus generated anywhere in Pakistan.

5. To initiate, organize and to carry on the business of manufacturer, importer, exporter, assembler and supplier of all kinds of heavy and light apparatus for the purpose of electric generation and also manufacture, import, export, supply and assemble accumulator wire, lumps, meters, batteries and all kind of engineering goods.

6. To carry on all kinds of business as manufacturers, importers, exporters, dealers, assembler and distributors of gas generators, humidifying, ventilating, cooling plant andall types of tools and equipment for industrial and commercial use.

7. To carry on the business of manufacturer, importer, fabricator, assembler, developer, designer, supplier, distributor, tabulator, seller, and to market, repair, service, replace, process and deal in all kinds of diesel, gas, petrol and kerosene generating sets, frequency converters, UPS, spare parts, air and gas treatment plants and equipment, air-conditioning plants, industrial fans, steam heaters, air filters, spray painting booths power plants, and complete systems of all kinds and description relating to generator, air technology and solar energy heat radiator, machineries, units, parts and allied products.

8. To carry on the business of manufacturers, importers, exporters, sellers, buyers and dealers whether as wholesalers or retailers of all kinds of electric motors and in particular fractional horsepower electric motors.

9. To manufacture, repair, purchase, sell, import, export or otherwise deal in generators, switchgears, meters, transformers, wire and cables, lamps, fans, fittings, electromedical and X-ray apparatus, heaters, radiators, ovens, refrigerators and air conditioning equipment.

10. To set up and establish undertakings for manufacturing of molds, dyes and other engineering items and to carry on the business as contractors in the field of civil, electrical and mechanical engineering.

11. To carry on, directly or indirectly, the business of mechanical, electrical, civil engineers, petrochemical engineers, drillers of soil and water wells, oil and gas wells, rock querrings, metals, minerals and precious stones; and to further carry on the business as engineers, consultants, contractors, planners, designers, surveyors, estimators and supervisors in any matter related to the above branches in or outside Pakistan.

12. To carry on the business of electrical, engineering and manufacturing of all kinds of heavy and light electrical machinery and electrical apparatus for any purpose whatsoever and to manufacture, install, sell and [illegible] for the supply of electricity, wires, lamps, engines, meter, dynamos, batteries, or telephonic apparatus.

13. To carry on the business of manufacturer and assemblers of agriculture tractors, components parts, agriculture machineries and equipment and to buy, sell and deals in tractors of all kinds.

14. To acquire or construct, maintain and alter any building or works necessary or convenient for the purpose of the company and to sale any such property as an when deemed fit.

15. To carry on the business of constructions of residential and town houses, bridges, markets, shops, showrooms, arcades, shopping centres, flats, offices, paint houses, townships, water works, electric generating stations, roads, tramways, underground rail roads, seaports, airports, heat, light, gas supply works, telegraphs works, hotels, cafeteria, lodging houses, huts, tanks, hospitals, restaurants, baths, places of worship, amusement, cremation and burial grounds, parks, gardens, libraries, reading rooms, orchestra stands, pavilions, taxi rickshaw and other vehicles stands, garages, dairy farms and all kinds of civil works.

16. To borrow or raise money or for the payment of money in any manner as the Company shall think fit and to secure the repayment of any money borrowed, raised or owing by mortgage, charge, standard security, lien or other security upon the whole or any part of Company's personal property and assets, present or future, and also to issue and deposit any securities which the Company has authority to issue by way of mortgage, charge, standard security, lien or other security to secure and guarantee the performance by the Company of any obligations or liabilities it may undertake or which may become binding on it.

17. To borrow funds by means of loans from commercial banks and government financial institutions for the Company's construction or manufacturing business in such manner as the company shall think fit and in particular by issue of debentures or debenture stock, perpetual or otherwise, charged upon all or any

the Company's property (both present and future) and to purchase, redeem and pay of any such securities.

18. To invest or deposit monies of the Company, not immediately required, in such shares, stocks, debentures, debenture stocks or in any investments, movable or immovable, in such manner as may from time to time be decided by the directors.

19. To amalgamate with any other company having objects altogether or in part similar to those of this Company, and to enter [illegible] partnership or any arrangement for sharing profits, union of interest, [illegible]ration, joint-venture, reciprocal concession or otherwise with any pers[illegible]ompany carrying on or engaged in, or about business or transaction which this Company is authorized to carry on or engage in, or about business or transaction capable of being conducted so as directly or indirectly to benefit this Company.

20. To enter into arrangement for sharing profits or into any union of interest, joint-venture, reciprocal concession or co-operation with any person or persons or local and foreign company or companies carrying on or engaged in communication related business or transaction which this company is authorized to carry on or engage in or any business or transaction capable of being conducted so as to directly or indirectly benefit the company.

21. To sell or dispose of any undertaking of the Company or and in particular for shares, debentures or securities of any other company having objects altogether or in part similar to those of this Company.

22. To distribute any of the Company's property among the members in specie or in kind or in any manner whatsoever, in case of winding up or dissolution of the Company.

23. To subscribe for, take or otherwise acquire and hold shares in, or any securities any other company having objects altogether or in part similar to those of this Company or carrying on any business capable of being conducted so as directly or indirectly benefit this Company or enhance the value of any of its property or for investment of additional Funds.

24. To p[illegible] or otherwise acquire the whole or any part of the business, goodwill an[illegible] of the company, firm or person carrying on or proposing to carry on any of [illegible]e businesses which the Company is authorized to carry on and to give and receive consideration For such acquisition and to undertake all or any of the liabilities of such company, firm or person.

25. To receive payment on the sale or disposal of the whole or any part of the business or property of the Company, either in cash, by installments or

otherwise, for such consideration as the Directors of the Company may think fit, and in particular for shares, debentures or otherwise in securities of any company and generally to dispose, hold or otherwise deal with any shares, stocks or securities so acquired.

26. To purchase, register, apply for or otherwise acquire and use any patent, patent right, design, copyright, license, concession, convenience, innovation, invention, trade marks, or process, rights or privileges, plants, tools or machinery and the like in Pakistan or elsewhere, which may For the time being appear to be useful or valuable for adding to the efficiency or productivity of the company' work or business, with the permission of the concerned authorities and to expend money for their improvement as may be necessary or convenient for the purposes of the business or businesses of the Company.

27. To open any current, overdraft, cash credit account of fixed account with any bankers and to pay money into and draw money from any such account.

28. To make, draw, accept, endorse, discount, execute or negotiate and issue, negotiate and discount cheques, promissory notes, bills of exchange, bills of lading, warrants, deposit notes, debentures, letter of credit and other negotiable or transferable instruments or securities concerning this Company.

29. To undertake and execute any trusts, undertaking whereof may seem desirable and either gratuitously or otherwise.

30. To subscribe, donate money for any national, charitable, benevolent, public, general or useful objects including any educational institution, hospital, flood or famine relief fund and other institution or fund established for religious or charitable purpose.

31. To establish and support, or aid in establishment and support of associations, institutions, funds, trusts, and conveniences calculated to benefit persons who are or have been Directors of or who are or have been employed by or who are serving or have served the Company or any company which is a subsidiary or associate of the Company or dependents or connections of such persons and to grant pensions and allowances and to make payments towards insurance etc.

32. To [illegible] such means of making known the business and products of the Company as may seem expedient, and in particular by advertisement in press, by circulars, by exhibition of works of art or interest, by publication of books and periodicals and by granting prizes, rewards, and also giving advertisement as permissible under law.

33. To apply for and obtain necessary consents, permissions and licence from any Government, state, local and other authorities for enabling the Company to carry on any of its objects effectively as and when required by law.

34. To establish and maintain offices, branches and local registers and to procure registration of the Company and to carry on business in any part of the world and to take such steps as may be necessary to give the Company such rights and privileges in any part of the world as are possessed by local companies or partnerships or as may be thought desirable.

35. To remunerate any company, person or firm by way of consideration for rendering services received by the Company either by cash payment or by allotment to him or them of shares or other securities of the Company credited as paid up in full or otherwise as may be thought expedient.

36. To do and perform all or any of above things and such other things as are incidental or may be thought conducive to the attainment of above objects or any of them in any part of the world, and as principals, agents, contractors, importers, exporters or otherwise and by or through trustees, agents, or otherwise, and either alone or in conjunction with others.

37. Notwithstanding anything stated in any object clause, the Company shall not engage in banking or the business of an investment company, leasing, insurance, managing agency or any unlawful business and shall not by advertisement, pamphlets, other means or other negotiation, offer for sale or take advance money for the further sale of plots, houses, flats etc., are acquired and have been developed by the company and that nothing in the object clause shall be construed to entitle it to engage in such business. The Company shall not launch multilevel marketing, pyramid and Ponzi schemes. It is further declared that the company would not indulge in any sort of real estate business, housing colonies, purchase and sale of plots and development of land and housing finance company business as mentioned in NBFC Rules, 2003.

38. Notwithstanding anything stated in any object clause, the Company shall obtain such other approval or licence from the competent authority, as may be required under any law for the time being in force to undertake a particular business.

LIABILITY

IV. The liability of the members is limited.

CAPITAL

V. The authorised capital of the company is Rs. 10,000,000- (Rupees Ten Million) divided into 10,000 (Ten Thousand) Ordinary shares of Rs.1,000 (Rupees One Thousand) each with the rights, privileges and conditions attaching thereto as are provided by the regulations of the Company for the time being, with powers to increase, reduce, sub-divide, consolidate or reorganise the capital of the Company and to divide the shares in the capital of the Company for the time being into several classes in accordance with the provisions of the Companies Ordinance, 1984 and to attach thereto respectively such special rights, privileges or conditions as may be determined in accordance with the regulations of the Company, provided however, that as between various classes of ordinary shares, if any, as to profits, votes and benefits shall be strictly proportionate to the paid up value of the shares.

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We the several persons, whose name and addresses are subscribed, are desirous of being formed into a Company, in pursuance of this Memorandum of Association and to take the number of shares in the capital of the Company set opposite to our respective names.

Sr. No.	Name and Surname (Present and former) In full block letters	Father's/ Husband's Name in full	Nationality with any former Nationality	Occupation	Residential Address in Full	Number of shares taken by each subscriber	Signature of the subscriber
1	Mr. NADEEM MALIK CNIC No. 42000-6656497-9	S/o Riaz Malik	Pakistani	Business Foam Manufacturing	Plot No. 75, Khayaban-e-Shaheen, Phase VI, D.H.A, Karachi	300	
2	Mr. NAJEEB MALIK CNIC No. 35201-2088787-3	S/o Riaz Malik	Pakistani	Business Foam Manufacturing	Plot No. 321, Block K, Phase 1, Lahore Cantt Cooperative Housing Society, Lahore	300	
3	Mr. SHAHZAD MALIK CNIC No. 352019-295415-7	S/o Naveed Malik	Pakistani	Business	126- Y Block, Street No. 18, D.H.A. Lahore	300	
					Total	**900**	

Dated 30th day of April, 2015

Witness to Signature

MR. AMIR MUSHTAQ BUTT S/O MUSHTAQ AHMED BUTT

CNIC: 35202-3058104-1

82 – C-1, Gulberg III, Lahore.

PUBLIC COMPANY LIMITED BY SHARES

INCORPORATED UNDER THE COMPANIES ORDINANCE, 1984

ARTICLES OF ASSOCIATION

MASTER SOLAR ENERGY LIMITED

PRELIMINARY

1. Company to be governed by the Articles & Table 'A' not to apply.

The Regulations contained in Table 'A' in the First Schedule to the Companies Ordinance, 1984 shall not apply to the Company except to the extent and as hereinafter, expressly incorporated. In case of any conflict between the provisions referred to and the provisions herein contained and the incorporated Regulations of Table 'A', the provisions herein contained shall prevail.

INTERPRETATION

2. In the interpretation of these Articles, words importing the singular shall include the plural, and vice versa and words importing the masculine gender shall include feminine gender and words importing persons shall also include corporate bodies.

AEDB	The 'AEDB' means the Alternative Energy Development Board, a statutory body corporate formed under the Alternative Energy Development Board Act, 2010.
Articles	The 'Articles' means these Articles as originally framed or as from time to time altered in accordance with law.
[illegible]	The 'Board' means Board of Directors for the time being of the Company
Commission	The 'Commission' means Securities and Exchange Commission of Pakistan.
Chief Executive	The 'Chief Executive' means an individual who subject to the control and Executive directions of the directors, is entrusted

with the whole, or substantially the whole, of the powers of management of the affairs of the company and includes a director or any other person occupying the position of a chief executive, by whatever name called, and whether under a contract of service or otherwise.

Company	The name of the Company is "MASTER SOLAR ENERGY LIMITED".
Directors	The 'Directors' means the Directors for the time being of the Company.
Dividend	The 'Dividend' includes bonus shares.
Document	'Document' includes summon, notice, requisition, order, other legal process, voucher and register.
Member	'Member' means a person whose name is for the time being entered in the Register of Members by virtue of his being a subscriber to the Memorandum and Articles of Association of the Company or of his holding by allotment or otherwise any share, scrip or other security which gives him a voting right in the Company.
Month	'Month' means the calendar month according to the English Calendar.
Office	'The Office' means the Registered Office for the time being of the Company.
Ordinance	'The Ordinance' means the Companies Ordinance, 1984.
Ordinary Share Capital	'Ordinary Share Capital' includes any shares of the Company with voting or other rights of management and control, and any securities of the Company that are convertible into such shares at the option of the holder.
Proxy	'Proxy' includes an Attorney duly constituted under a Power of Attorney.
Pubic Company	"Means a company which is not a private Company under Companies Ordinance, 1984"

RHD

Register	'The Register' means the Register of Members to be kept in pursuance to Section 147 of the Ordinance.
Registrar	'The Registrar' means the Registrar of Companies having jurisdiction on the Company.
Redeemable Capital	'Redeemable Capital' includes finance obtained on the basis of Participation Terms Certificate Musharika Certificate, Term Finance Certificate (TFC) or any other security or obligation based on interest, other than an ordinary share of the company representing an instrument or a certificate of specified denomination called the face value or nominal value evidencing investment of the holder in the capital of the company on terms and conditions of the agreement for the issue of such instrument or certificate or such other certificate or instrument as the Federal Government may by notification in the official Gazette specify for the purpose.
Section	'Section' means Section of the Ordinance.
Seal	'The Seal' means the common seal of the Company
Security	'Security' means any share, script, debenture, Participation Term Certificate, Modaraba Certificate, Musharika Certificate, Term Finance Certificate, bond, pre-organisation certificate or such other instrument as the Federal Government may, by notification in the official Gazette, specify for the purpose.
Writing	'In Writing' and written include printing, lithography and other modes of representing or reproducing words in a visible form.
*Expression	Words and phrases used herein but not defined shall be assigned the same meaning as given to them in the Ordinance.

BUSINESS

3. Object

The business of the company shall include the several objects expressed in Clause of the Memorandum of Association or any of them.

4. Commencement

The directors shall have regard to the restrictions as to the commencement of business imposed by Section 146, if and so far as such restrictions are binding upon the company.

SHARES

5. Share Capital

The authorised capital of the company is Rs. 10,000,000/- (Rupees Ten Million) divided into 10,000 (Ten Thousand) Ordinary shares of Rs.1,000/- (Rupees One Thousand) each with the rights, privileges and conditions attaching thereto as are provided by the regulations of the Company for the time being, with powers to increase, reduce, subdivide, consolidate or reorganise the capital of the Company and to divide the shares in the capital of the Company for the time being into several classes in accordance with the provisions of the Ordinance and to attach thereto respectively such special rights, privileges or conditions as may be determined by or in accordance with the regulations of the Company, provided however, that rights, as between various classes of ordinary shares, if any, as to profits, votes and other benefits shall be strictly to the paid up value of the shares.

6. Allotment of Shares under the control of the Directors

Subject to the provisions of these Articles and to the provisions of Section 86, the shares shall be under the control of the directors who may allot or otherwise dispose of the same to such persons, on such terms and conditions, and either at premium or at par and at such times, as the directors think fit and with full power to give to any person the right to call for the allotment of any shares either at par or premium for such time and for such consideration as the directors think fit.

7. Issuance of shares at discount

With the prior approval of the shareholders in a General Meeting of the Company and with the sanction of the Securities and Exchange Commission of Pakistan and upon otherwise complying with the provisions of Section 84, it shall be lawful for the Directors to issue shares in the capital of the Company at discount.

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8. **Variation of shareholders rights**

If at any time the share capital is divided into different classes of shares, the rights attached to any class (unless provided by the terms of issue of the shares of that class) may subject to the provisions of Section 108 be varied with the consent in writing of the holders of three fourths of the issued shares of that class, or with the sanction of a special resolution passed at a separate general meeting of the holders of the shares of the class. To every such separate general meeting, the provisions of these regulations slating to general me[illegible] all mutandis apply, but so that the necessary shall be three persons at [illegible]ding or representing by Proxy and having twenty five percent of the issu[illegible]s of that class.

9. **Allotment and Minimum Subscription**

The Directors shall in making the allotments duly observe the provisions of Section 68 to 73 as may be applicable to the Company. The minimum subscription upon which the Directors may proceed to allotment as defined in Section 68 is fixed at Rs. 900,000/-.

10. **Trust not recognized**

Save as herein otherwise provided, the company shall be entitled to treat the registered holder of any share as the absolute owner thereof and accordingly shall not, except as ordered by a court of competent jurisdiction or as by statute required, be bound to recognize equitable, contingent, future, partial or other claim to or interest in such share on the part of any other person.

11. **Company and Corporate Body may hold shares**

Shares may be registered in the name of any limited company or other corporate body. Unless the directors otherwise consent in any case, not more than four persons shall be registered joint-holders of any share.

12. **Issue of shares to banks and financial institution**

[illegible]ided in Section 87, the directors may issue ordinary shares, or grant option [illegible].vert into ordinary shares, the outstanding balance of any loans, advances or cr[illegible]its or other non-interest bearing securities and obligations outstanding or having a term of not less than three years in the manner provided in any contract with any schedule bank or a financial institution to the extent of twenty percent of such balance.

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13. Issue of Redeemable Capital

The directors may issue to banks or financial institutions either severally, jointly or through a syndicate, Redeemable Capital in consideration of any funds, moneys, accommodations received or to be received by the company whether in cash or in specie or against promise, guarantee, undertaking or indemnity issued to or in favour or benefit of the company.

14. Offer for Subscription

No share shall be offered for subscription except upon the term that the amount payable on application shall be the full amount of the nominal value of the share.

CERTIFICATE

15. Certificate

Every person whose name is entered as a member in the Register shall, without payment, be entitled to receive, within two months after allotment or within forty-five days of the application or registration of transfer, a certificate under the seal specifying the share or shares held by him and the amount paid up thereon.

16. Joint holder

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

17. Duplicate Certificate

If a share certificate is defaced, lost or destroyed, it may be renewed on payment of such fee, if any, not exceeding one rupee, 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. Within forty-five days of the application [illegible] shall issue certificate to the applicant.

18. Prohibition on Purchase of its own Shares

Except to the extent and in the manner allowed by Section 95, 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.

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ISSUANCE AND TRANSFER OF SHARES

19. Registration of Transfer

The directors shall not refuse to transfer any fully paid shares unless the transfer deed is defective or invalid. The directors may also suspend the registration of transfers during ten days immediately by giving seven days previous notice in the manner provided in the Ordinance. The directors may decline to recognise any instrument of transfer unless :

a. a fee not exceeding two 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.

If the directors refuse to register a transfer of shares, they shall within forty five 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.

20. Execution of Transfer

The instrument of transfer of any share in the company shall be executed both by the transferor and the transferee, and transferor shall be deemed to remain holder of the share until the name of the transferee entered in the register of members in respect thereof. No transfer shall be made to an infant or person of unsound mind.

21. Form of Transfer

Shares in the company shall be transferred in any usual or common form which the directors shall approve.

TRANSMISSION OF SHARES

22. Shares of Deceased

The executors, administrators, heirs or nominees, as the case may be, of a deceased sole holder of share shall be the only persons recognised by the company as having

RAD

any title to the share. In the case of a share in the name of two or more holders, the survivor or survivors, or the executors or administrators of the survivor or survivors shall be the only persons recognised by the company as having any title to the share.

23. Nomination by Members

A member I shareholder may deposit with the company a nomination conferring on one or more persons the right to acquire the interest in the shares therein specified in the event of his death. Provisions of Se[illegible]0 will apply in case of all such nominations.

24. Entitlement of Shares

Any person becoming entitled to a share in consequence of the death or bankruptcy or insolvency of a member shall, upon such evidence being produced as may from time to time be required by the directors, have the right, either to be registered as a member in respect of the share or, instead of being registered himself, to make such transfer of the share as the deceased or insolvent person could have made; but the directors shall, in either case, have the same right to decline or suspend registration as they would have had in the case of transfer of the share by the deceased or insolvent person before the death or insolvency.

25. Entitlement of Dividend

A person becoming entitled to a share by reason of the death or bankruptcy or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he was the registered holder of the share, except that he shall not, before being registered as a member in respect of the share, be entitled in respect of it to exercise any right conferred by membership in relation to meetings of the company.

ALTERATION AND FURTHER ISSUE OF CAPITAL

26. Increase in Share Capital

The company may, from time to time, by special resolution increase the share capital by such sum, to be divided into shares of such amount, as the resolution shall prescribe. 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.

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27. Consolidation, Division, Sub-division and Cancellation of Shares

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 clause (d) of sub-section (I) of Section 92;

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.

28. Offer for new shares

Subject to the provisions of Section 86 all new shares shall, before issue be offered to such persons as at the date of the offer are entitled to receive notices from the company of general meetings 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 notice specifying the number of shares offered, and limiting a time within which the offer, if not accepted will be deemed 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 the regulation.

29. Reduction of Capital

The company may, by special resolution, reduce its share capital in any manner and with, and subject to, any incident authorised and consent required by Sections 96 to 106 provided the reduction so made shall not disturb the requirement of minimum paid up capital.

30. Surrender of Shares

Subject to the provisions of the Ordinance, the directors may accept from any member the surrender of all or any of his shares on such terms as shall be agreed.

GENERAL MEETING

31. Statutory Meeting

Subject to provisions of Section 157 the Statutory General Meeting of the company shall be held within a period of not less than three months and not more than six months from the date of entitlement of commencement of business.

32. Annual General Meeting

A general meeting, to be called annual general m[illegible] shall be held as may be determined by the directors, in accordance with the provisions of Section 158, within eighteen months from the date of incorporation of the company and thereafter once at least in every calendar year within a period of four months following the close of its financial year and not more than fifteen months after the holding of its last preceding annual general meeting.

33. Extra ordinary General Meeting

All general meetings of a company other than the statutory meeting or an annual general meeting mentioned in Sections 157 and 158 respectively shall be called Extraordinary General Meetings.

34. Calling of an Extra ordinary General Meeting

The directors may, whenever they think fit, call an extraordinary general meeting. Extraordinary general meeting shall also be called on such requisition, or in default, may be called by such requisitionists, as is provided by Section 159. 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.

NOTICE AND PROCEEDINGS OF GENERAL MEETING

35

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 Ordinance for the general meeting, to such persons as are, under the

RAD

Ordinance or the regulations of the company, entitled to receive such notices 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. In case of extraordinary general meeting, a shorter notice may be given with the consent of Registrar as provided in Section 159 and for passing a special resolution, meeting may be convened on a shorter notice with the consent of all the members as provided in Section 2 (1)(36) of the Ordinance.

36. Special Business

All business shall be deemed special that is transacted at an extraordinary general meeting, and also all that is transacted at an annual general meeting with the exception of declaring a dividend, the consideration of the accounts, balance sheet and the reports of the directors and auditors, the election of directors, the appointment of, and the fixing of the remuneration of the auditors.

37. Quorum

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; save as herein otherwise provided, members having twenty five percent of the voting power present in person or through proxy and two members personally present shall be a quorum.

38. Adjourned Meeting

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.

39. Chairman

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.

40. Power to Adjourn General Meeting

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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 ten 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.

41. Adoption of Resolution

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.

42. Demand for Poll

A poll may be demanded only in accordance with the provisions of Section 167.

43. Manner and Time of Taking Poll

If a poll is duly demanded, it shall be taken in accordance with manner laid down in Section 168 and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded. A poll demanded on the election of chairman or on a question of adjournment shall be taken at once.

44. Casting Vote

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.

VOTES OF MEMBERS

45. Right to Vote

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

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one vote except for election of directors in which case the provisions of Section 178 shall apply. On a poll every member shall have voting rights as laid down in Section 160.

46. Vote may be given either personally or by proxy and voting by Corporation Representative

Where a corporation or company is a member of the Company, a person duly appointed by resolution of directors to represent such corporation at a meeting of the Company in accordance with the provisions of Section 162 shall not be deemed to be as instrument of proxy or power of attorney and the production at the meeting of a copy of such resolution certified as, a true copy by a Director of such corporation or by the Chief Executive thereof (if any) shall on production at the meeting be accepted by the Company as sufficient evidence of the validity of his appointment.

47. Vote of Joint-holders

In case of joint-holders, the vote of the senior who tenders a vote, whether in person or by proxy, 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.

48. Vote by member of unsound mind

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, by his committee or other legal guardian. and any such committee or guardian may, on a poll, vote by proxy.

49. Proxy to be in writing

The instrument appointing a proxy shall be in writing under the hand of the appointer or of his attorney duly authorised in writing. A proxy must be a member.

50. Deposit of instrument of Proxy

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.

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51. Form of Proxy

An instrument appointing a proxy may be in any usual or common form or as near thereto which the directors shall approve.

52. Validity of Proxy

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 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

53. Directors

The subscribers to the Memorandum of Association shall be the first directors of the Company namely:

1. Mr. Najeeb Malik
2. Mr. Nadeem Malik
3. Mr. Shahzad Malik

54. Number of Directors

Subject to the provisions of Section 178 (1) of the Ordinance, the Company may from time to time in annual general meeting increase or decrease the number of directors. However, such number shall not in any case be less than three.

55. Nominated Directors

The company may have directors nominated by the company's creditors or other stakeholders by virtue of contractual agreements.

56. Alternate Director

A director who is about to leave or is absent from Pakistan may with the approval of the directors appoint any person to be an alternate director during his absence from the country provided such absence shall not be less than for a period of three months and such appointment shall have effect and such appointee whilst he holds office as an alternate director, shall be entitled to notice of the meeting of

RAD

the directors and to attend and vote thereat accordingly but shall ipso facto vacate office when his appointer returns to the country or vacates office as director, if the company in General Meeting removes the appointee from office and any appointment and removal under the clause shall be affected by notice in writing under the hand of director making the same.

57. Remuneration of Director

The remuneration of a director for performing extra services, including holding of the office of Chairman, and the remuneration to [illegible] to any director for attending the meeting of the directors or a committee of directors shall from time to time be determined by the Board of Directors in accordance with the law.

POWER AND DUTIES OF DIRECTORS

58. Management of Business

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 Ordinance 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 Ordinance 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 shall invalidate any prior act of the directors which would have been valid if these regulations had not been made.

59. Power to appoint Attorney

The directors may from time to time by power of attorney under the Company's Seal, appoint any person or persons to be the attorney(s) of Company for such purposes and with such powers, authorities and discretions (not exceeding those vested in or exercisable by the directors under these presents) and for such period and subject to such conditions as the directors may from time to time think fit. Any such attorney(s) may, if authorised by the directors, delegate all or any of the powers vested in him/them.

60. [illegible]s of Directors

The directors shall duly comply with the provisions of the Ordinance 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 and charges 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

RAD

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 copy of the register of directors and notifications of any changes therein.

61. Power to Borrow

Subject to the provisions of Section 196, the directors may from time to time at their discretion borrow such sum or sums as they may think fit for the purpose of the company including from any banks and Financi[illegible]itions and secure the payment or repayment of such sum or sums in such [illegible]r and upon such terms and conditions as they think fit by mortgage or ch[illegible]on the whole or any part of the property present and future or any such other way as the directors may think expedient. The company may raise and secure payment of any sum by issue of Redeemable Capital. The Redeemable Capital may be issued at a discount, premium or otherwise with special privilege as to redemption, conversion into shares with voting rights and their subsequent reconversion into Redeemable Capital.

62. Mortgages and Charges

The directors shall cause a proper register to be kept in accordance with Section 135 of all mortgages and charges specifically affecting the property of the company and shall duly comply with the requirements of Sections 121, 122 and 129 in regard to registration of mortgages and charges and shall also duly comply with the requirements of Section 130 as to keeping a copy of every instrument creating any mortgage or charge and the requirements of Section 132 as to giving intimation of the payment or satisfaction of any charge or mortgage created.

63. Disclosure of Interest by Directors

Every director or his relative who is in any way, whether directly or indirectly, concerned or interested in any contract or arrangement entered into, or to be entered into, by or on behalf of the company shall disclose the nature of his concern or interest at a meeting of the directors, as required by Section 214.

64 [illegible]es to be made

The directors shall cause minutes to be made in books provided for the purpose:

a. of all appointments of officers made by the directors;

b. of the names of the directors present at each meeting of the directors and of any committee of the directors;

c. of all resolutions and proceedings at all meetings of the company and of the directors and of committees of directors;

and every director present at any meeting of directors or committee of directors shall sign his name in a book to be kept for that purpose. A copy of the minutes of the board of directors shall be furnished to every director within fourteen days of the date of meeting.

DISQUALIFICATION OF DIRECTORS

65. Ineligibility

No person shall become director of the Company if he suffers from any of the disabilities or disqualifications mentioned in Section 187 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 a 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

66. Meetings of Directors

The directors may meet together for the dispatch of business, adjourn and otherwise regulate their meetings, as they think fit. The quorum for a meeting of directors shall not be less than one-third of their number or two, whichever is greater. Questions arising at any meeting shall be decided by a majority of votes. In case of an equality of votes, the Chairman shall have and exercise a second or casting vote. A director may, and the secretary on the requisition of a director shall, at any time, summon a meeting of directors. It shall not be necessary to give notice of a meeting of directors to any director for the time being absent from Pakistan.

67. Minimum number of meetings

The directors shall meet at least once in each quarter of a year as required by Section 193 (2) of the Ordinance.

68. Delegation of Power to Committees

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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.

69. Chairman

The directors may elect a chairman of their meeting 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 fifteen 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.

70. Chairman of Committee meetings

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 fifteen 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.

71. Proceedings of Committee Members

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.

72. Validity of Director's Acts

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.

73. Resolution in Writing

A resolution in writing signed by all the directors or affirmed by them through telex or telegram shall be as valid and effectual as if it had been passed at a meeting of directors duly convened and held.

RAD

ELECTION AND REMOVAL OF DIRECTORS

74. Period of Office

The First Directors of the company shall retire from their offices at the first Annual General Meeting of the Company, and directors shall be elected in their place in accordance with Section 178 for a term of three years, unless they resign earlier, become disqualified for being directors or otherwise cease to hold office.

75. Election

The directors shall comply with the provisions of Sections 178, 183 and 184 relating to election of directors and matters ancillary thereto.

76. Eligibility

A retiring director shall be eligible for re-election.

77. Casual Vacancy

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.

78. Mode of Election

The number of directors determined by the Board shall be elected to hold office by the members in general meeting in the following manner:

a. A member shall have such number of votes as is equal to the product of the number of voting shares or securities held by him and the number of directors to be elected;

b. A member may give all his votes to a single candidate or divide them between more than one of the candidates in such manner as he may choose;

c. The candidate who gets the highest number of votes shall be declared elected as director and then the candidate who gets the next highest number of votes shall be so declared and so on until the total number of directors to be elected has been so elected.

79. Removal

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The Company may by resolution in general meeting remove a director appointed under Section 176 or Section 180 or elected in the manner provided for in Section 178.

Provided that a resolution for removing a director shall not be deemed to have been passed if the number of votes cast against it is equal to, or exceeds:

a. the minimum number of votes that were cast for the election of a director at the immediately preceding election of directors if resolution relates to removal of a director elected in the manner provided in sub-section (5) of Section 178; or

b. the total number of votes for the time being computed in the manner laid down in sub-section (5)of Section 178 divided by the number of directors for the time being, if the resolution relates to removal of a director appointed under Section 176 or Section 180.

80. Vacation of Office

A director shall ipso facto cease to hold office if:

a. he becomes ineligible to be appointed a director on any one or more of the grounds enumerated in Section 187.

b. he absents himself from three consecutive meetings of directors or from all the meetings of the directors for a continuous period of three months, whichever is the longer, without leave of absence from the directors

c. he or any firm of which he is a partner or any private company of which he is a director :

i. without the sanction of the company in general meeting accepts or holds any office of profit under the company other than that of Chief Executive or legal or technical adviser or a banker: or

ii. accepts a loan or guarantee from the company in contravention of Section 195.

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CHIEF EXECUTIVE

81. First Appointment

The directors of the company as from a not later than the fifteenth day after the date of its incorporation appoint any individual to be the chief executive, of the Company.

82. Form of Office

The chief executive appointed as aforesaid sha[illegible]s he earlier resigns or otherwise ceases to hold offices, hold the firs[illegible] general meeting of the company or, if a shorter period is fixed by the directors at the time of his appointment, for such period.

83. Remuneration

The remuneration of the Chief Executive shall be fixed by the directors from time to time.

84. Power of Chief Executive

The Chief Executive of the Company shall, subject to the provisions of Section 196 of the Ordinance, have such powers of financial, administrative and operational nature that are delegated by the Board of Directors.

85. Subsequent Appointment and Term of Office

Within fourteen days from the date of election of directors under Section 178 or the office of the chief executive falling vacant, as the case may be, the directors of a company shall appoint any person, including an elected director, to be the chief executive, but such appointment shall not be for a period exceeding three years from the date of appointment.

86. Eligibility for Reappointment

[illegible] expiry of his term of office under Section 198 or 199, a chief executive [illegible]e eligible for reappointment.

87. Continuation of office until appointment of Successor

The chief executive retiring under Section 198 or 199 shall continue to perform his functions until his successor is appointed unless non-appointment of his successor is due to any fault on his part or his office is expressly terminated.

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88. Terms and Conditions

The terms and conditions of appointment of a chief executive shall be determined by the directors.

89. Deemed to be Director

The chief executive shall, if he is not already a director of the company, be deemed to be its director and be entitled to all the rights and privileges, and subject to all the liabilities, of that office.

90. Ineligibility

No person who is ineligible to become a director of a company under Section 187 shall be appointed or continue as chief executive of the company.

91. Removal

The directors of a company by resolution passed by not less than three fourths of the total number of directors for the time being, or the company by a special resolution, may remove a chief executive before the expiration of his of office notwithstanding anything contained in these Articles or in any agreement between the company and such chief executive.

SEAL

92. Common Seal

The directors shall provide a common seal of the company which shall not be affixed to any instrument except by the authority of resolution of the board of directors or by committee of directors authorised in that behalf by the directors, and two directors or one director.

93. Office Seal

The directors may provide for the use in any territory, district or place not situated in Pakistan, of an official seal which shall be facsimile of the common seal of the company, with addition on its face of the name of every territory, district or place where it is to be used. The provisions of Section 213 shall apply to the use of such official seal.

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DIVIDENDS AND RESERVES

94. Declaration of Dividend

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

95. Interim Dividend

The directors may from time to time pay to the mer ch interim dividends as appear to the directors to be justified by the pro e company.

96. Dividend out of Profits only

No dividends shall be paid otherwise than out of profits of the year or any other undistributed profits.

97. No Dividend out of Capital Profi

No dividend shall be declared or paid out of profits made from sale or disposal of any immovable property or assets of a capital nature comprised in the undertaking except after such profits are set off or adjusted against losses arising from the sale of any such immovable property or assets of capital nature.

98. Dividend in Proportion to Amount paid

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, but if and so long as nothing is paid upon any of the shares in the company, dividends be declared and paid according to the amounts of the shares. No amount paid on a share in advance of calls shall be treated for the purposes of this regulation as paid on the share.

99. I d in Specie

Any general meeting declaring a dividend may resolve that such dividends be paid wholly or in part by the distribution of specific assets and in particular of paid up shares or debentures either of the company or in any one or more such ways.

100. Transfer to Reserve

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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 Ordinance, from time to time think fit.

101. Retention of Profit

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

102. Capitalisation of Reserve

Any General Meeting may resolve that moneys, investment or other assets forming part of the Company standing to the credit of the Reserve Fund or in the hands of the Company and available for dividend or representing premiums received on the issue of shares and standing to the credit of the shares premium accounts be capitalised and distributed amongst such of the shareholders as would be entitled to receive the same if distributed by way of dividend and in the same proportions on the footing that they become entitled thereto as capital and that all or any part of such capitalised funds be applied on behalf of such shareholder in paying up in full any unissued shares of the Company which shall be distributed accordingly and that such distribution or payment shall be accepted by such shareholders in full satisfaction of their interest in the said capitalised sum.

103. Dividend to Registered holders only

Dividend shall be paid only to registered holders of such shares or to his banker or to his order to a financial institution nominated by the shareholder.

104. Effect of Transfer

...er of shares shall not pass the right to any dividend declared thereon before ...gistration of the transfer.

105. Retention in certain cases

The Directors may retain the dividends payable upon shares in respect of which any person is under the transmission clause entitled to become a member or which

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any person under that clause is entitled to transfer until such person becomes a member in respect thereof or shall duly transfer the same.

106. Dividend to joint holders

Any one of the several persons who are registered as the joint holders of any share may give effectual receipt for all dividends and payments on account of dividends in respect of such share.

107. Mode of Payment

Unless otherwise directed any dividend may be paid by cheque or warrant sent through the post to the registered address of the member entitled, or in the case of joint holders to the registered address of that one whose name stands first on the register in respect of the joint holding and every cheque or warrant so sent shall be made payable to the order of the person to whom it is sent.

108. Unclaimed dividend

All dividends unclaimed for one year after having been declared may be invested or otherwise made use of by the directors for the benefit of the Company until claimed.

109. Time of Payment

The dividends shall be paid within the period laid down in Section 251.

BOOKS AND ACCOUNTS

110. Books of Account

The directors shall cause to be kept proper books of account as required under Section 230.

111. Place where Books of Account kept

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.

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112. Inspection by Members

The directors shall from time to time determine whether and to what extent and at what time and place 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.

113. Annual Accounts

The directors shall as required by Sections 233 and 236 cause to be prepared and to be laid before the company in general meeting such profit and loss accounts or income and expenditure accounts and balance sheets duly audited and reports as are referred to in those sections.

114. Presentation of Annual Accounts before Annual General Meeting

A balance sheet, profit and loss account, income and expenditure account and other reports referred to in clause 113 above shall be made out in every year and laid before the company in the annual general meeting made upto a date not more than four months before such meeting. The balance sheet and profit and loss account or income and expenditure account shall be accompanied by a report of the auditors of the company and the report of directors.

115. When Accounts Settled

Every account of the company when audited and approved by a general meeting shall be conclusive except as regards any errors discovered therein within three months next after the approval thereof. Whenever any such error is discovered within that period, the account shall forthwith be corrected and thenceforth shall be conclusive.

116. Copies to be sent to Members

A copy of the balance sheet and profit and loss account or income and expenditure account 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 meeting in the manner in which notices are to be given hereunder.

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117. Compliance with the Ordinance

The directors shall in all respect comply with the provisions of Sections 230 to 236.

AUDIT

118. Audit

Auditors shall be appointed and their duties regulated in accordance with Sections 252 to 255.

NOTICES

119. Mode of Service of Notice

A notice may be given by the company to any member either personally or by sending it by post to him to his registered address or (if he has no registered address in Pakistan) to the address, if any, within Pakistan supplied by him to the company for the giving of notices to him. 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 would be delivered in the ordinary course of post.

120. Notice by Newspaper

If a member has no registered address in Pakistan, and has not supplied to the company an address within Pakistan for the giving of notices to him, the Company shall comply with the requirements of section of the Ordinance.

121. Notice to joint holders

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.

122. Notice to person entitled to transmission

A notice may be given by the company to the persons entitled to a share in consequence of the death or insolvency of a member by sending it through post in a prepaid letter addressed to them by name. or by the title of representatives of the deceased, or assignee of the insolvent or by any like description, at the address if any) in Pakistan supplied for the purpose by the person claiming to be so entitled,

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or (until such an address has been so supplied) by giving the notice in any manner in which the same might have been given if the death or insolvency had not occurred.

123. Notice of General Meeting

Notice of every general meeting shall be given in same manner hereinbefore authorized to:

a. every member of the company except those ... who, having no registered address within Pakistan, have supplied to the company an address within Pakistan for the giving of notices to them 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.

SECRECY

124. Secrecy

Every Director, Chief Executive, Secretary, Auditor, Trustee, Member of Committee. Officer, Servant, Agent, Accountant or other person employed in the business of the Company shall, if so required by the directors before entering upon his duties, sign a declaration pledging himself to observe a strict secrecy respecting all transactions of the company with the customers and the state of accounts with individuals and in matters relating thereto and shall by such declaration pledge himself not to reveal any of the matters which may come to his knowledge in the discharge of his duties except when required to do so by the directors or by any meeting or by a court of law or by the person to whom such matters relate and except so far as may be necessary in order to comply with any of the provisions in these presents.

125. Member's Access to Company Premises

No member or other person (not being a director) shall be entitled to enter the ... of the company or examine the company's premises or properties without the permission of a director, subject to Article 125 to require discovery of or any information respecting any detail of the Company's trading or any matter which is or may be in the nature of a trade secret. mystery of trade or secret process or of any matter whatsoever which may relate to the conduct of the business of the company and which in the opinion of the directors will be inexpedient in the interest of the members of the company, to communicate.

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WINDING UP

126. Division of Assets in Specie

If the company is wound up, the liquidator may, with the sanction of a special resolution of the company and any other sanction required by the Ordinance, 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.

127. Valuation by Liquidator

For the purpose aforesaid, the liquidator may set [illegible]ue 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.

128. Assets in Trust

The liquidator may, with the like sanction, vest the whole or any part of such assets in trustees upon such trust for the benefit of the contributories as the liquidator, with the like sanction, thinks fit, but so that no member shall be compelled to accept any shares or other securities whereon there is any liability.

INDEMNITY

129. Director's and other's right to Indemnify

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 488 in which relief is granted to him by the Court.

ARBITRATION

130. Differences to be referred to

[illegible]ever any difference arises between the company on the one hand and any of the members, their executors, administrators or assigns on the other hand, the true intent or construction, or the incident or consequences of these Articles or of the statutes, or touching anything there or thereafter done. executed, omitted or suffered in pursuance of these Articles or of the statutes or touching any breach or alleged breach of these Articles, or any claim on account of any such breach or alleged breach, or otherwise relating to the premises, or to these Articles or to any

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statute affecting the company or to any of the affairs of the Company, every such difference shall, as a condition precedent to any other action at law be referred in conformity with the Arbitration Act, 1940, or any statutory modification thereof and any rules made thereunder, to the decision of an arbitrator to be appointed by the parties in difference or if they cannot agree upon a single arbitrator to the decision of two arbitrators of whom one shall be appointed by each of the parties in difference, or in the event of the two arbitrators not agreeing, then of an umpire to be appointed by the two arbitrators, in writing, before proceeding on the reference, and such decision shall be final and binding on the parties.

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We the several persons, whose name and addresses are subscribed, are desirous of being form into a Company, in pursuance of this Memorandum of Association and to take the number of shares in the capital of the Company set opposite to our respective names.

Sr. No.	Name and Surname (Present and former) In full block lettes	Father's/ Husband's Name in full	Nationality with any former Nationality	Occupation	Residential Address in Full	Number of shares taken by each subscriber	Signature of the subscriber
1	Mr. NADE[illegible]MALIK CNIC No. 4230[illegible] 8656497-9	S/o Riaz Malik	Pakistani	Business Foam Manufacturing	Plot No. 75, Khayaban-e-Shaheen, Phase VI, D.H.A, Karachi	300	
2	Mr. NAJEEB MALIK CNIC No. 35201-7088787-3	S/o Riaz Malik	Pakistani	Business Foam Manufacturing	Plot No. 321, Block K, Phase 1, Lahore Cantt Cooperative Housing Society, Lahore	300	
3	Mr. SHAHZAD MALIK CNIC No. 352019-295415-7	S/o Naveed Malik	Pakistani	Business	126- Y Block, Street No. 18, D.H.A. Lahore	300	
					TOTAL	**900**	

Dated 30th day of April, 2015

Witness 1. Signature

MR. AMIR MUSHTAQ BUTT S/O MUSHTAQ AHMED BUTT

CNIC: 35202-3058104-1

82 – C-1, Gulberg III, Lahore.

ANNEXURE – D
ANNUAL REPORTS OF THE COMPANY

RAO & COMPANY
CHARTERED ACCOUNTANTS

TELEPHONES
32412778 & 32412779
FAX: 32419452
E-mail: audit@raoandco.com.pk
raoandco_ca@yahoo.com

4, Karachi Chambers
Hasrat Mohani Road
P.O. Box 5061
Karachi-2
PAKISTAN

INDEPENDENT AUDITOR'S REPORT

To the members of Master Solar Energy Limited

Report on the Audit of the Financial Statements

Opinion

We have audited the annexed financial statements of Master Solar Energy Limited (the Company), which comprise the statement of financial position as at June 30, 2024 and the statement of profit or loss and other comprehensive income, the statement of changes in equity, the statement of cash flows for the year then ended, and notes to the financial statements, including material accounting policies information 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, the statement of profit or loss and other comprehensive income, the statement of changes in equity and the statement of cash flows together with the notes forming parts thereof conform with accounting and reporting standards as applicable in Pakistan and give the information required by the Companies Act, 2017 (XIX of 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, 2024 and of the loss, 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 the International Ethics Standards Board for Accountants' Code of Ethics for Professional Accountants as adopted by the Institute of Chartered Accountants of Pakistan (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.

Information Other than the Financial Statements and Auditor's Report Thereon

Management is responsible for the other information. The other information comprises the information included in the annual report, but does not include the financial statements and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

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In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

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 accounting and reporting standards as applicable in Pakistan and the requirements of Companies Act, 2017 (XIX of 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 operations, 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 judgement 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

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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.

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 (XIX of 2017);

b) the statement of financial position, the statement of profit or loss and other comprehensive income, 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 (XIX of 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 (XVIII of 1980).

The engagement partner on the audit resulting in this independent auditor's report is Abdul Rafay.

Rao & Company
Chartered Accountants
Karachi

Date: 07 October 2024
UDIN: AR202410267XiQoD95pb

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF FINANCIAL POSITION

AS AT JUNE 30, 2024

	Note	2024 Rupees	2023 Rupees
ASSETS			
NON-CURRENT ASSETS			
Property, plant and equipment	4	3,776,862	3,776,862
CURRENT ASSETS			
Tax refunds due from government	5	11,071	9,612
Interest income receivable		167	1,052
Cash and bank balance	6	32,975	138,310
		44,213	148,974
		3,821,075	3,925,836
EQUITY AND LIABILITIES			
SHARE CAPITAL AND RESERVES			
Authorised share capital			
10,000 ordinary shares of Rs. 1,000 each (2023: 10,000)		10,000,000	10,000,000
Issued, subscribed and paid up capital			
900 (2023: 900) Ordinary share of Rs. 1,000 each fully paid in cash		900,000	900,000
Loan from director	7	3,777,500	3,777,500
Revenue reserve			
Accumulated loss		(970,715)	(865,954)
		3,706,785	3,811,546
CURRENT LIABILITIES			
Trade and other payables	8	114,290	114,290
CONTINGENCIES AND COMMITMENTS	9		
		3,821,075	3,925,836

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

FOR THE YEAR ENDED JUNE 30, 2024

	Notes	2024 Rupees	2023 Rupees
Administrative expenses			
Fees and subscription		**(5,600)**	(4,532)
Auditors' remuneration		**(108,000)**	(116,000)
Operating loss		**(113,600)**	(120,532)
Interest income on deposit account		**8,839**	12,067
Loss for the year		**(104,761)**	(108,465)
Other comprehensive income / (loss)		**-**	-
Total comprehensive loss		**(104,761)**	(108,465)

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED JUNE 30, 2024

	2024 Rupees	2023 Rupees
CASH FLOWS FROM OPERATING ACTIVITIES		
Loss for the year	(104,761)	(108,465)
Operating loss before working capital changes	(104,761)	(108,465)
Working Capital Changes		
Decrease in current assets		
Interest income receivable	885	185
Increase in current liabilities		
Trade and other payables	-	8,000
Cash used in operations	(103,876)	(100,280)
Income tax paid	(1,459)	(1,838)
Net cash outflow from operating activities	(105,335)	(102,118)
CASH FLOWS FROM INVESTING ACTIVITIES	-	-
CASH FLOWS FROM FINANCING ACTIVITIES	-	-
Net decrease in cash and cash equivalents	(105,335)	(102,118)
Cash and cash equivalents at the beginning of the year	138,310	240,428
Cash and cash equivalents at the end of the year	32,975	138,310

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF CHANGES IN EQUITY

FOR THE YEAR ENDED JUNE 30, 2024

	Issued, subscribed and paid-up capital	Loan from director	Revenue reserve	Total
			Accumulated loss	
	Rupees			
Balance at June 01, 2022	900,000	3,777,500	(757,489)	4,008,786
Loss for the year	-	-	(108,465)	(108,465)
Balance at June 30, 2023	900,000	3,777,500	(865,954)	3,811,546
Balance at July 01, 2023	**900,000**	**3,777,500**	**(865,954)**	**3,811,546**
Loss for the year	-	-	(104,761)	(104,761)
Balance at June 30, 2024	**900,000**	**3,777,500**	**(970,715)**	**3,706,785**

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED
NOTES TO THE FINANCIAL STATEMENTS
FOR THE YEAR ENDED JUNE 30, 2024

1 Corporate and general information

1.1 Legal status and operations

Master Solar Energy Limited (the 'Company') was incorporated on May 28, 2015, as public limited company under the Companies Ordinance, 1984 (Repealed with enactment of the Companies Act, 2017).

The Company's principal objective is to carry on the business of supplying general electric power and to setup and operate solar power generation projects to generate, accumulate, distribute and supply electricity.

The geographical location and address of the company's business units, including plant is as under.

- The registered office of the Company is situated at Master House, 82 C - 1, Gulberg III, Lahore.

The Company is under consideration to develop solar powered plant.

2 BASIS OF PREPRATION

2.1 Statement of compliance

These financial statements have been prepared in accordance with the accounting and reporting standards as applicable in Pakistan for financial reporting. The accounting and reporting standards as applicable in Pakistan comprise of such International Financial Reporting Standards (IFRS Standards), issued by International Accounting Standard Board (IASB) as notified under Companies Act, 2017 (the "Act"); and provisions of and directives issued under the Act. Where the provisions of and directives issued under the Companies Act, 2017 differ from the IFRS standards, the provisions of and directives issued under the Companies Act, 2017 have been followed.

2.2 Basis of measurement

These financial statements have been prepared under the historical cost convention as per accounting policies consistently applied during the period except as other wise stated in the respective policies and notes given hereunder.

2.3 Functional and presentation currency

These financial statements are presented in Pak Rupees, which is the functional and presentation currency of the Company. Amounts presented in the financial statements have been rounded off to the nearest of Rupee unless otherwise stated.

2.4 Key judgements and estimates

The preparation of financial statements in conformity with the accounting and reporting standards as applicable in Pakistan requires the use of certain critical accounting estimates.

In addition, it requires management to exercise judgement in the process of applying the Company's accounting policies. The areas involving a high degree of judgement or complexity, or areas where assumptions and estimates are significant to the financial statements, are documented in the following accounting policies and notes, and relate primarily to:

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- Capital work in process – Note 3.1
- Estimation of provisions - Note 3.7
- Current income tax expense and provision for current tax - Note 3.8

The revisions to accounting estimates (if any) are recognised 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.

2.5 Change in accounting standards, interpretations and amendments to published approved accounting standards

a There are certain amendments and interpretations to the accounting and reporting standards which are mandatory for the Company's annual accounting period which began on July 1, 2023. However, these do not have any significant impact on the Company's financial statements except as disclosed in note 3 to these financial statements.

b Standards, amendments and interpretations to existing standards that are not yet effective and have not been early adopted by the Company:

		Effective date (annual reporting periods beginning on or after)
IAS 1	Presentation of Financial Statements (Amendments)	January 1, 2024
IAS 7	Statement of Cash Flows (Amendments)	January 1, 2024
IFRS 16	Leases (Amendments)	January 1, 2024
IAS 21	The Effects of changes in Foreign Exchange Rates (Amendments)	January 1, 2025
IFRS 7	Financial Instruments: Disclosures (Amendments)	January 1, 2026
IFRS 17	Insurance Contracts	January 1, 2026
IFRS 9	Financial Instruments – Classification and Measurement of Financial Instruments (Amendments)	January 1, 2026

c The above standards, amendments to approved accounting standards and interpretations are not likely to have any material impact on the Company's financial statements.

d Other than the aforesaid standards, interpretations and amendments, International Accounting Standards Board (IASB) has also issued the following standards and interpretation, which have not been notified locally or declared exempt by the Securities and Exchange Commission of Pakistan (SECP) as at 30 June 2024;

IFRS 1	First-time Adoption of International Financial Reporting Standards
IFRIC 12	Service Concession Arrangement
IFRS 18	Presentation and Disclosures in Financial Statements
IFRS 19	Subsidiaries without Public Accountability: Disclosures

3 Material Accounting Policies Information

The Company adopted disclosure of Accounting Policies (Amendments to IAS 1 and IFRS practice statements 2 'Making Materiality Judgments') from 01 July, 2023. Although amendments did not result in any changes to the accounting policies themselves, they impact the accounting policy information disclosed in the financial statements.

The amendments require disclosure of 'material', rather than 'significant' accounting policies. The amendments also provide the guidance on the application of materiality to disclosure of accounting policies, assisting entities to provide useful entity specific accounting policy information that user need to understand other information in the financial statements.

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The material accounting policies set out below have been applied consistently to all periods presented in these financial statements.

3.1 Capital work in progress

Capital work-in-progress is stated at cost less any identified impairment loss. All expenditure connected with specific assets incurred during installation and construction period are carried under capital work-in-progress. These are transferred to operating fixed assets as and when these are available for use.

3.2 Trade debts, loans, advances, deposits and other receivables

These are initially measured at the fair value of the consideration receivable. Subsequently these are valued at amortized cost. These assets are written off when there is no reasonable expectation of recovery. Credit loss is based on the expected credit loss.

3.3 Cash and cash equivalents

Cash and cash equivalents are carried in the statement of financial position at cost. For the purpose of Cash Flow Statement, cash and cash equivalent comprise cash in hand and cash with banks.

3.4 Loan from directors

Loan from director is accounted for by using Technical Release-32 "Accounting Directors' Loan" (TR 32) issued by the Institute of Chartered Accountants of Pakistan (ICAP) on 25 January 2016 which provided specific guidance on Director's loan that are interest free and repayable at the discretion of the entity. Loan from director is accounted for as per clause 3.3.1 of TR 32 which states that "A loan to an entity by the director which is agreed to be paid at the discretion of the entity does not pass the test of liability and is to be recorded as equity at face value. This is not subsequently remeasured.

3.5 Financial instruments

Financial assets

Initial measurement

The Company classifies its financial assets in to

- fair value through other comprehensive income (FVOCI);
- fair value through profit or loss (FVTPL); and
- measured at amortized cost.

A financial asset is initially measured at fair value plus, for an item not at FVTPL, transaction costs that are directly attributable to its acquisition.

Subsequent measurement

Debt investments at FVOCI

These assets are subsequently measured at fair value. Interest / markup income calculated using the effective interest method, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss. Other net gains and losses are recognized in other comprehensive income. On de-recognition, gains and losses accumulated in other comprehensive income are reclassified to the statement of profit or loss.

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Equity investments at FVOCI

These assets are subsequently measured at fair value. Dividends are recognized as income in the statement of profit or loss unless the dividend clearly represents a recovery of part of the cost of the investment. Other net gains and losses are recognized in other comprehensive income and are never reclassified to the statement of profit or loss.

Financial assets at FVTPL

These assets are subsequently measured at fair value. Net gains and losses, including any interest / markup or dividend income, are recognized in statement of profit or loss.

Financial assets measured at amortized cost

These assets are subsequently measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss.

Short term investments

Investment in Term deposits is classified as amortized cost and are initially measured at fair value. Transaction costs directly attributable to the acquisition are included in the carrying amount. Subsequently these investments are measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, losses and impairment are recognized in the statement of profit or loss.

Impairment of financial assets

The Company recognizes loss allowances for ECLs in respect of financial assets measured at amortized cost and fair value through other comprehensive income.

The Company measures loss allowances at an amount equal to lifetime ECLs, except for the following, which are measured at 12-month ECLs:

- debt securities that are determined to have low credit risk at the reporting date; and
- other debt securities and bank balance for which credit risk (i.e. the risk of default occuring over the expected life of the financial instrument) has not increased significantly since initial recognition.

Loss allowances for trade receivables are always measured at an mount equal to lifetime ECLs.

When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECLs, the Company considers reasonable and supportable information that is relevant and available without undue cost or effort. This includes both quantitative and quantitative information and analysis, based on the Company's historical experience and informed credit assessment and including forward-looking information.

The Company assumes that the credit risk on a financial asset has increased significantly if it is more than past due for a reasonable period of time. Lifetime ECLs are the ECLs that result from all possible default events over the expected life of a financial instrument. 12-month ECLs are the portion of ECLs that result from default events that are possible within the 12 months after the reporting date (or a shorter period if the expected life of the instrument is less than 12 months). The maximum period considered when estimating ECLs is the maximum contractual period over which the Company is exposed to credit risk.

Loss allowances for financial assets measured at amortized cost are deducted from the Gross carrying amount of the assets.

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The Gross carrying amount of a financial asset is written off when the Company has no reasonable expectations of recovering of a financial asset in its entirety or a portion thereof. The Company individually makes an assessment with respect to the timing and amount of write-off based on whether there is a reasonable expectation of recovery. The Company expects no significant recovery from the amount written off. However, financial assets that are written off could still be subject to enforcement activities in order to comply with the Company's procedures for recovery of amounts due.

De-recognition

Financial assets are derecognized when the rights to receive cash flows from the financial assets have expired or have been transferred and the Company has transferred substantially all risks and rewards of ownership.

Financial liabilities

Financial liabilities are classified as measured at amortized cost or 'at fair value through profit or loss' (FVTPL). A financial liability is classified as at FVTPL if it is classified as held for trading, it is a derivative or it is designated as such on initial recognition. Financial liabilities at FVTPL are measured at fair value and net gains and losses, including any interest expense, are recognized in the statement of profit or loss.

Other financial liabilities are subsequently measured at amortized cost using the effective interest method. Interest expense and foreign exchange gains and losses are recognized in the statement of profit or loss. Any gain or loss on de-recognition is also recognized in the statement of profit or loss.

Financial liabilities are derecognized when the contractual obligations are discharged or cancelled or have expired or when the financial liability's cash flows have been substantially modified.

Offsetting of financial assets and financial liabilities

Financial assets and financial liabilities are set off and only the net amount is reported in the statement of financial position when there is a legally enforceable right to set off the recognized amount and the Company intends to either settle on a net basis, or to realize the asset and settle the liability simultaneously.

3.6 Trade and other payables

Liabilities for trade and other amounts payable are carried at cost which is the fair value of the consideration to be paid in the future for goods and services received, whether or not billed to the Company.

3.7 Provisions

A provision is recognized in the statement of financial position when the Company has a present legal or constructive obligation as a result of past event and it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation of which reliable estimate can be made. The expense relating to provision is presented in statement of comprehensive income net of any reimbursements. Provisions are reviewed at each statement of financial position date and adjusted to reflect the current best estimate. The management expects that time value of money is not material and no discounting of provision is made by the Company.

3.8 Taxation

Current

Provision for current tax is based on the taxable income for the year determined in accordance with the prevailing law for taxation of income. The charge for current tax is calculated using prevailing tax rates or tax rates expected to apply to the profit for the year if enacted after taking into account tax credits, rebates and exemptions, if any. The charge for current tax also includes adjustments, where considered necessary, to provision for tax made in previous years arising from assessments framed during the year for such years.

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Deferred

Deferred tax is accounted for using the statement of financial position liability method in respect of all temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of the taxable profit. However, the deferred tax is not accounted for if it arises from initial recognition of an asset or liability in a transaction other than a business combination that at the time of transaction neither affects accounting nor taxable profit or loss. Deferred tax liabilities are generally recognised for all taxable temporary differences and deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which the deductible temporary differences, unused tax losses and tax credits can be utilised.

Deferred tax is calculated at the rates that are expected to apply to the period when the differences reverse based on tax rates that have been enacted or substantively enacted by the statement of financial position date. Deferred tax is charged or credited in the profit and loss account, except in the case of items credited or charged to equity in which case it is included in equity.

Deferred tax asset not recognized	2024 Rupees	2023 Rupees
Deductible temporary difference		
Carry forward tax losses	132,615	176,960

3.9 Mark-up bearing borrowings and borrowing cost

Mark-up bearing borrowings are recognized initially at fair value, less attributable transaction cost. Subsequent to initial recognition, mark up bearing borrowings are stated at amortized cost, while the difference between the cost (reduced for periodic payments) and redemption value is recognized in the statement of profit or loss account over the period of the borrowings using the effective interest method. Borrowing costs are recognised as an expense in the period in which these are incurred, except that those which are directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale) are capitalized as part of the cost of that asset.

3.10 Foreign exchange

Foreign currency transactions are recorded at the exchange rate applicable at the transactions date. Monetary assets & liabilities are translated into Rupees using exchange rates applicable at the statement of financial position date. All gains and losses on settlement and transaction at year end are recognised in statement of profit and loss.

3.11 Impairment

The carrying amount of the Company's assets are reviewed at each statement of financial position date to determine whether there is any indication of impairment loss. If such evidence exists, the recoverable amount of assets is estimated in order to determine the extent of the impairment loss, if any. Impairment losses are recognized as expense in statement of profit and loss.

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	Note	2024 Rupees	2023 Rupees
4 PROPERTY, PLANT AND EQUIPMENT			
Capital work in progress		3,776,862	3,776,862
5 TAX REFUNDS DUE FROM GOVERNMENT			
Advance income tax		1,459	1,838
Income tax refundable		9,612	7,774
		11,071	9,612
6 CASH AND BANK BALANCE			
Cash in hand		5,428	1,129
Current account		9,096	9,046
Saving account	6.1	18,451	128,135
		27,547	137,181
		32,975	138,310

6.1 The balance in saving accounts carry mark up at the rates from 10% to 11.01% per annum (2023 : 6.5% to 10% per annum)

7 LOAN FROM DIRECTOR			
Loan from director	7.1	3,777,500	3,777,500

7.1 This represent unsecured and interest free loan from director of the Company, the loan is repayable at the discretion of the Company.

8 TRADE AND OTHER PAYABLES			
Audit fee payable		108,000	108,000
Other payables		6,290	6,290
		114,290	114,290

9 CONTINGENCIES AND COMMITMENTS

There were no contingencies and commitments to report at the year end (2023: Nil).

10 REMUNERATION OF CHIEF EXECUTIVE, DIRECTORS AND EXECUTIVES

No remuneration were paid to the Chief Executive, any of the directors and executive of the Company.

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11 FINANCIAL INSTRUMENTS AND RISK MANAGEMENT

The Company finances its operations through equity, borrowing and management of working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

Taken as a whole the Company's risk arising from financial instruments is limited as there is no significant exposure to price and cash flow risk in respect of such instruments. Financial instruments of the Company are as under:

	2024 Rupees	2023 Rupees
Financial Instruments by category		
Financial assets at amortised cost		
Interest income receivable	167	1,052
Cash and bank balance	32,975	138,310
	33,142	139,362
Financial liabilities at amortised cost		
Trade and other payables	114,290	114,290

a) Financial risk management objectives

The Company has exposure to the following risks from financial instruments:

- Credit risk
- Liquidity risk
- Market risk

The Board of Directors of the Company has the overall responsibility for establishment and oversight of the Company's risk management framework. To assist the Board in discharging its oversight responsibility, the management has been made responsible for identifying, monitoring and managing the company's financial risk exposure. The Company's overall risk management program focuses on the under predictability of financial markets and seek to minimize potential adverse effects on the Company's financial performance.

b) Credit risk

Credit risk is a risk that one party to a financial instrument will fail to discharge an obligation and cause the other party to incur a financial loss, without taking into account the fair value of any collateral. Concentration of credit risk arises when a number of financial instruments or contracts are entered into with same party, or when counter parties are engaged in similar business activities, or activities in the same geographical region, or have similar economic features that would cause their ability to meet contractual obligations to be similarly effected by change in economics, political or other conditions. Concentration of credit risk indicate the relative sensitivity of the Company's performance to developments affecting a particular industry.

At the reporting date, the Company's total credit risk was concentrated in the following industrial / economic sectors:

RAD

	2024	
	Rupees	%
Interest income receivable	167	1%
Bank balance	27,547	99%
	27,714	100%

	2023	
	Rupees	%
Interest income receivable	1,052	1%
Bank balance	137,181	99%
	138,233	100%

	2024	2023
	Rupees	Rupees
The maximum exposure to credit risk at the reporting date is:		
Interest income receivable	167	1,052
Bank balance	27,547	137,181
	27,714	138,233

The credit quality of assets that are neither past due nor impaired can be assessed by reference to historical information and external credit ratings or to historical counterparty default rates.

The credit risk on bank balances is limited because the counter parties are banks with reasonably high credit ratings.

The credit quality of bank balances are as follows:

	Short term rating	Rating agency	2024 Rupees	2023 Rupees
Balances with banks				
- Bank Al Habib Limited	A1+	PACRA	9,096	9,046
- Meezan Bank Limited	A1+	JCR - VIS	18,451	128,135
			27,547	137,181

Due to the Company's long standing business relationships with this counterparty and after giving due consideration to its strong financial standing, management does not expect non-performance by this counter party on its obligations to the Company. Accordingly, the credit risk is minimal.

c) **Liquidity risk management**

Liquidity risk is the risk that the Company will encounter difficulty in meeting its financial obligations as they fall due. Liquidity risk arises because of the possibility that the Company could be required to pay its liabilities earlier than expected or may face difficulty in raising funds to meet commitments associated with financial liabilities as they fall due.

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The Company is exposed to liquidity risk in respect of trade and other payable.

The Company's approach to manage liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Company's reputation.

The table below analyses Company's financial liabilities into relevant maturity groupings based on the remaining period at the balance sheet date to maturity date and represents the undiscounted cash flows. The amounts in the table are the gross nominal undiscounted cash flows.

	2024			
	Carrying amount	Contractual cash flows	Within one year	One to five years
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	114,290	114,290	114,290	-

	2023			
	Carrying amount	Contractual cash flows	Within one year	One to five years
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	114,290	114,290	114,290	-

d) Market risk

Market risk is the risk that changes in market interest rates, equity prices, foreign exchange rates and credit spreads (not relating to changes in the obligor's / issuer's credit standing) will affect the Company's income or the value of its holdings of financial instruments. The objective of market risk management is to manage and control market risk exposures within acceptable parameters, while optimizing the return on risk.

e) Interest rate risk management

Interest / mark up rate risk management arises from the possibility of changes in interest / mark up rates which may affect the value of financial instruments. At the balance sheet date the Company is not exposed to any interest rate risk.

f) Capital risk management

The objective of the Company when managing capital is to safeguard its ability to continue as a going concern so that it can continue to provide returns for shareholders and to maintain a strong base to support the sustained development of its business.

The Company manages its capital structure by monitoring return on net assets and make adjustments to it in the light of changes in economic conditions.

The Company finances its expansion projects through equity, borrowings and management of its working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

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12 FAIR VALUES OF FINANCIAL INSTRUMENTS

Fair value is the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The carrying values of financial assets and liabilities reflected in the financial statements approximate their fair values.

Financial assets which are tradable in an open market are revalued at the market prices prevailing on the balance sheet date. The estimated fair value of financial assets and liabilities considered not significantly different from their book value.

Fair value hierarchy

The different level have been defined as follows:

- Quoted prices (unadjusted) in active markets for identical assets or liabilities (level 1);
- Inputs other than quoted prices included within level 1 that are observable for the asset or liability, either directly (i.e as prices) or indirectly (i.e derivede from prices) Level 2 ; and
- Inputs for the asset or liability that are not based on observable market data (level 3).

There were no transfers amongst levels during the year.

13 RELATED PARTY TRANSACTIONS

Related parties comprise key management personnel. The related parties with whom the Company had entered into transactions or had arrangements / agreements in place during the year have been disclosed below along with their basis of relationship and percentage shareholding in the Company:

Name of related party	Basis of relationship	%age of shareholding of the Company
Mr. Nadeem Malik	Director	33.34%
Mr. Najeeb Malik	Director	33.33%
Mr. Shahzad Malik	Director	33.33%

14 NUMBER OF EMPLOYEES

Total number of employees as at the end of the year	-	-
Average number of employees during the year	-	-

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15 GENERAL

15.1 Figures have been rounded off to the nearest Rupee.

15.2 The comparative figures have been re-arranged or re-classified wherever necessary for the purpose of better presentation.

16 AUTHORISATION

These Financial statements were approved by the Board of Directors in their meeting held on 07 OCT 2024

Chief Executive

Director

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RAO & COMPANY
CHARTERED ACCOUNTANTS

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INDEPENDENT AUDITOR'S REPORT

To the members of Master Solar Energy Limited

Report on the Audit of the Financial Statements

Opinion

We have audited the annexed financial statements of Master Solar Energy Limited (the Company), which comprise the statement of financial position as at June 30, 2023 and the statement of profit or loss and other comprehensive income, the statement of changes in equity, the statement of cash flows 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, the statement of profit or loss and other comprehensive income, the statement of changes in equity and the statement of cash flows together with the notes forming parts thereof conform with accounting and reporting standards as applicable in Pakistan and give the information required by the Companies Act, 2017 (XIX of 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, 2023 and of the loss, 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 the International Ethics Standards Board for Accountants' Code of Ethics for Professional Accountants as adopted by the Institute of Chartered Accountants of Pakistan (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.

Information Other than the Financial Statements and Auditor's Report Thereon

Management is responsible for the other information. The other information comprises the information included in the annual report, but does not include the financial statements and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

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In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

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 accounting and reporting standards as applicable in Pakistan and the requirements of Companies Act, 2017 (XIX of 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 operations, 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 judgement 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.

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- 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.

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 (XIX of 2017);

b) the statement of financial position, the statement of profit or loss and other comprehensive income, 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 (XIX of 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 (XVIII of 1980).

The engagement partner on the audit resulting in this independent auditor's report is Abdul Rafay.

Rao & Company
Chartered Accountants
Karachi

Date: 06 October 2023
UDIN: AR202310267yb6tMCTOo

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF FINANCIAL POSITION

AS AT JUNE 30, 2023

	Note	2023 Rupees	2022 Rupees
ASSETS			
NON-CURRENT ASSETS			
Property, plant and equipment	4	**3,776,862**	3,776,862
CURRENT ASSETS			
Tax refunds due from government	5	**9,612**	7,774
Interest income receivable		**1,052**	1,237
Cash and bank balance	6	**138,310**	240,428
		148,974	249,439
		3,925,836	4,026,301
EQUITY AND LIABILITIES			
SHARE CAPITAL AND RESERVES			
Authorised share capital			
10,000 ordinary shares of Rs. 1,000 each (2022: 10,000)		**10,000,000**	10,000,000
Issued, subscribed and paid up capital			
900 (2022: 900) Ordinary share of Rs. 1,000 each fully paid in cash		**900,000**	900,000
Loan from director	7	**3,777,500**	3,777,500
Accumulated loss		**(865,954)**	(757,489)
		3,811,546	3,920,011
CURRENT LIABILITIES			
Trade and other payables	8	**114,290**	106,290
CONTINGENCIES AND COMMITMENTS	9		
		3,925,836	4,026,301

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

FOR THE YEAR ENDED JUNE 30, 2023

	Notes	2023 Rupees	2022 Rupees
Administrative expenses			
Fees and subscription		**(4,532)**	(915)
Auditors' remuneration		**(116,000)**	(100,000)
Operating loss		**(120,532)**	(100,915)
Interest income on deposit account		**12,067**	12,140
Loss for the year		**(108,465)**	(88,775)
Other comprehensive income / (loss)		**-**	-
Total comprehensive loss		**(108,465)**	(88,775)

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

MASTER SOLAR ENERGY LIMITED

STATEMENT OF CASH FLOWS

FOR THE YEAR ENDED JUNE 30, 2023

	Notes	2023 Rupees	2022 Rupees
CASH FLOWS FROM OPERATING ACTIVITIES			
Loss for the year		**(108,465)**	(88,775)
Operating loss before working capital changes		**(108,465)**	(88,775)
Working Capital Changes			
Decrease / (Increase) in current assets			
Interest income receivable		**185**	(485)
Increase in current liabilities			
Trade and other payables		**8,000**	1,015
Cash used in operations		**(100,280)**	(88,245)
Income tax paid		**(1,838)**	(1,748)
Net cash outflow from operating activities		**(102,118)**	(89,993)
CASH FLOWS FROM INVESTING ACTIVITIES		-	-
CASH FLOWS FROM FINANCING ACTIVITIES		-	-
Net decrease in cash and cash equivalents		**(102,118)**	(89,993)
Cash and cash equivalents at the beginning of the year		**240,428**	330,421
Cash and cash equivalents at the end of the year		**138,310**	240,428

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED

STATEMENT OF CHANGES IN EQUITY

FOR THE YEAR ENDED JUNE 30, 2023

	Issued, subscribed and paid-up capital	Loan from directors	Accumulated loss	Total
	Rupees			
Balance at June 30, 2021	900,000	3,777,500	(668,714)	4,008,786
Loss for the year	-	-	(88,775)	(88,775)
Balance at June 30, 2022	900,000	3,777,500	(757,489)	3,920,011
Loss for the year	-	-	(108,465)	(108,465)
Balance at June 30, 2023	**900,000**	**3,777,500**	**(865,954)**	**3,811,546**

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED
NOTES TO THE FINANCIAL STATEMENTS
FOR THE YEAR ENDED JUNE 30, 2023

1 Corporate and general information

1.1 Legal status and operations

Master Solar Energy Limited (the 'Company') was incorporated on May 28, 2015, as public limited company under the Companies Ordinance, 1984 (Repealed with enactment of the Companies Act, 2017).

The Company's principal objective is to carry on the business of supplying general electric power and to setup and operate solar power generation projects to generate, accumulate, distribute and supply electricity.

The geographical location and address of the company's business units, including plant is as under.

- The registered office of the Company is situated at Master House, 82 C - 1, Gulberg III, Lahore.

The Company is under consideration to develop solar powered plant.

2 BASIS OF PREPRATION

2.1 Statement of compliance

These financial statements have been prepared in accordance with the accounting and reporting standards as applicable in Pakistan for financial reporting. The accounting and reporting standards as applicable in Pakistan comprise of such International Financial Reporting Standards (IFRS Standards), issued by International Accounting Standard Board (IASB) as notified under Companies Act, 2017 (the "Act"); and provisions of and directives issued under the Act. Where the provisions of and directives issued under the Companies Act, 2017 differ from the IFRS standards, the provisions of and directives issued under the Companies Act, 2017 have been followed.

2.2 Basis of measurement

These financial statements have been prepared under the historical cost convention as per accounting policies consistently applied during the period except as other wise stated in the respective policies and notes given hereunder.

2.3 Functional and presentation currency

These financial statements are presented in Pak Rupees, which is the functional and presentation currency of the Company. Amounts presented in the financial statements have been rounded off to the nearest of Rupee unless otherwise stated.

2.4 Key judgements and estimates

The preparation of financial statements in conformity with the accounting and reporting standards as applicable in Pakistan requires the use of certain critical accounting estimates.

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In addition, it requires management to exercise judgement in the process of applying the Company's accounting policies. The areas involving a high degree of judgement or complexity, or areas where assumptions and estimates are significant to the financial statements, are documented in the following accounting policies and notes, and relate primarily to:

- Capital work in process – Note 3.1
- Estimation of provisions - Note 3.7
- Current income tax expense and provision for current tax - Note 3.8

The revisions to accounting estimates (if any) are recognised 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.

2.5 Change in accounting standards, interpretations and amendments to published approved accounting standards

a) Standards, interpretations and amendments to published approved accounting standards that are effective.

There are certain amendments and interpretations to the accounting and reporting standards which are mandatory for the Company's annual accounting period which began on July 1, 2022. However, these do not have any significant impact on the Company's financial reporting.

b) Standard and amendments to approved accounting standards that are not yet effective.

There are certain amendments and interpretations to the accounting and reporting standards that will be mandatory for the Company's annual accounting periods beginning on or after July 1, 2023. However, these will not have any impact on the Company's

3 SIGNIFICANT ACCOUNTING POLICIES

The significant accounting policies consistently applied in the preparation of these financial statements are the same as those applied in earlier periods presented.

3.1 Capital work in progress

Capital work-in-progress is stated at cost less any identified impairment loss. All expenditure connected with specific assets incurred during installation and construction period are carried under capital work-in-progress. These are transferred to operating fixed assets as and when these are available for use.

3.2 Trade debts, loans, advances, deposits and other receivables

These are initially measured at the fair value of the consideration receivable. Subsequently these are valued at amortized cost. These assets are written off when there is no reasonable expectation of recovery. Credit loss is based on the expected credit loss.

3.3 Cash and cash equivalents

Cash and cash equivalents are carried in the statement of financial position at cost. For the purpose of Cash Flow Statement, cash and cash equivalent comprise cash in hand and cash with banks.

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3.4 Loan from directors

Loan from director is accounted for by using Technical Release-32 "Accounting Directors' Loan" (TR 32) issued by the Institute of Chartered Accountants of Pakistan (ICAP) on 25 January 2016 which provided specific guidance on Director's loan that are interest free and repayable at the discretion of the entity. Loan from director is accounted for as per clause 3.3.1 of TR 32 which states that "A loan to an entity by the director which is agreed to be paid at the discretion of the entity does not pass the test of liability and is to be recorded as equity at face value. This is not subsequently remeasured.

3.5 Financial instruments

Financial assets

Initial measurement

The Company classifies its financial assets in to following

- fair value through other comprehensive income (FVOCI);
- fair value through profit or loss (FVTPL); and
- measured at amortized cost.

A financial asset is initially measured at fair value plus, for an item not at FVTPL, transaction costs that are directly attributable to its acquisition.

Subsequent measurement

Debt investments at FVOCI

These assets are subsequently measured at fair value. Interest / markup income calculated using the effective interest method, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss. Other net gains and losses are recognized in other comprehensive income. On de-recognition, gains and losses accumulated in other comprehensive income are reclassified to the statement of profit or loss.

Equity investments at FVOCI

These assets are subsequently measured at fair value. Dividends are recognized as income in the statement of profit or loss unless the dividend clearly represents a recovery of part of the cost of the investment. Other net gains and losses are recognized in other comprehensive income and are never reclassified to the statement of profit or loss.

Financial assets at FVTPL

These assets are subsequently measured at fair value. Net gains and losses, including any interest / markup or dividend income, are recognized in statement of profit or loss.

Financial assets measured at amortized cost

These assets are subsequently measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss.

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Short term investments

Investment in Term deposits is classified as amortized cost and are initially measured at fair value. Transaction costs directly attributable to the acquisition are included in the carrying amount. Subsequently these investments are measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, losses and impairment are recognized in the statement of profit or loss.

Impairment of financial assets

The Company recognizes loss allowances for ECLs in respect of financial assets measured at amortized cost and fair value through other comprehensive income.

The Company measures loss allowances at an amount equal to lifetime ECLs, except for the following, which are measured at 12-month ECLs:

- debt securities that are determined to have low credit risk at the reporting date; and
- other debt securities and bank balance for which credit risk (i.e. the risk of default occuring over the expected life of the financial instrument) has not increased significantly since initial recognition.

Loss allowances for trade receivables are always measured at an mount equal to lifetime ECLs.

When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECLs, the Company considers reasonable and supportable information that is relevant and available without undue cost or effort. This includes both quantitative and quantitative information and analysis, based on the Company's historical experience and informed credit assessment and including forward-looking information.

The Company assumes that the credit risk on a financial asset has increased significantly if it is more than past due for a reasonable period of time. Lifetime ECLs are the ECLs that result from all possible default events over the expected life of a financial instrument. 12-month ECLs are the portion of ECLs that result from default events that are possible within the 12 months after the reporting date (or a shorter period if the expected life of the instrument is less than 12 months). The maximum period considered when estimating ECLs is the maximum contractual period over which the Company is exposed to credit risk.

Loss allowances for financial assets measured at amortized cost are deducted from the Gross carrying amount of the assets.

The Gross carrying amount of a financial asset is written off when the Company has no reasonable expectations of recovering of a financial asset in its entirety or a portion thereof. The Company individually makes an assessment with respect to the timing and amount of write-off based on whether there is a reasonable expectation of recovery. The Company expects no significant recovery from the amount written off. However, financial assets that are written off could still be subject to enforcement activities in order to comply with the Company's procedures for recovery of amounts due.

De-recognition

Financial assets are derecognized when the rights to receive cash flows from the financial assets have expired or have been transferred and the Company has transferred substantially all risks and rewards of ownership.

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Financial liabilities

Financial liabilities are classified as measured at amortized cost or 'at fair value through profit or loss' (FVTPL). A financial liability is classified as at FVTPL if it is classified as held for trading, it is a derivative or it is designated as such on initial recognition. Financial liabilities at FVTPL are measured at fair value and net gains and losses, including any interest expense, are recognized in the statement of profit or loss.

Other financial liabilities are subsequently measured at amortized cost using the effective interest method. Interest expense and foreign exchange gains and losses are recognized in the statement of profit or loss. Any gain or loss on de-recognition is also recognized in the statement of profit or loss.

Financial liabilities are derecognized when the contractual obligations are discharged or cancelled or have expired or when the financial liability's cash flows have been substantially modified.

Offsetting of financial assets and financial liabilities

Financial assets and financial liabilities are set off and only the net amount is reported in the statement of financial position when there is a legally enforceable right to set off the recognized amount and the Company intends to either settle on a net basis, or to realize the asset and settle the liability simultaneously.

3.6 Trade and other payables

Liabilities for trade and other amounts payable are carried at cost which is the fair value of the consideration to be paid in the future for goods and services received, whether or not billed to the Company.

3.7 Provisions

A provision is recognized in the statement of financial position when the Company has a present legal or constructive obligation as a result of past event and it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation of which reliable estimate can be made. The expense relating to provision is presented in statement of comprehensive income net of any reimbursements. Provisions are reviewed at each statement of financial position date and adjusted to reflect the current best estimate. The management expects that time value of money is not material and no discounting of provision is made by the Company.

3.8 Taxation

Current

Provision for current tax is based on the taxable income for the year determined in accordance with the prevailing law for taxation of income. The charge for current tax is calculated using prevailing tax rates or tax rates expected to apply to the profit for the year if enacted after taking into account tax credits, rebates and exemptions, if any. The charge for current tax also includes adjustments, where considered necessary, to provision for tax made in previous years arising from assessments framed during the year for such years.

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Deferred

Deferred tax is accounted for using the statement of financial position liability method in respect of all temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of the taxable profit. However, the deferred tax is not accounted for if it arises from initial recognition of an asset or liability in a transaction other than a business combination that at the time of transaction neither affects accounting nor taxable profit or loss. Deferred tax liabilities are generally recognised for all taxable temporary differences and deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which the deductible temporary differences, unused tax losses and tax credits can be utilised.

Deferred tax is calculated at the rates that are expected to apply to the period when the differences reverse based on tax rates that have been enacted or substantively enacted by the statement of financial position date. Deferred tax is charged or credited in the profit and loss account, except in the case of items credited or charged to equity in which case it is included in equity.

Deferred tax asset not recognized	**2023**	**2022**
	Rupees	**Rupees**
Deductible temporary difference		
Carry forward tax losses	176,960	173,927

3.9 Mark-up bearing borrowings and borrowing cost

Mark-up bearing borrowings are recognized initially at fair value, less attributable transaction cost. Subsequent to initial recognition, mark up bearing borrowings are stated at amortized cost, while the difference between the cost (reduced for periodic payments) and redemption value is recognized in the statement of profit or loss account over the period of the borrowings using the effective interest method. Borrowing costs are recognised as an expense in the period in which these are incurred, except that those which are directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale) are capitalized as part of the cost of that asset.

3.10 Foreign exchange

Foreign currency transactions are recorded at the exchange rate applicable at the transactions date. Monetary assets & liabilities are translated into Rupees using exchange rates applicable at the statement of financial position date. All gains and losses on settlement and transaction at year end are recognised in statement of profit

3.11 Impairment

The carrying amount of the Company's assets are reviewed at each statement of financial position date to determine whether there is any indication of impairment loss. If such evidence exists, the recoverable amount of assets is estimated in order to determine the extent of the impairment loss, if any. Impairment losses are recognized as expense in statement of profit and loss.

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11 FINANCIAL INSTRUMENTS AND RISK MANAGEMENT

The Company finances its operations through equity, borrowing and management of working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

Taken as a whole the Company's risk arising from financial instruments is limited as there is no significant exposure to price and cash flow risk in respect of such instruments. Financial instruments of the Company are as under:

	2023	2022
	Rupees	Rupees
Financial Instruments by category		
Financial assets at amortised cost		
Interest income receivable	**1,052**	1,237
Cash and bank balance	**138,310**	240,428
	139,362	241,665
Financial liabilities at amortised cost		
Trade and other payables	**114,290**	106,290

a) Financial risk management objectives

The Company has exposure to the following risks from financial instruments:

- Credit risk
- Liquidity risk
- Market risk

The Board of Directors of the Company has the overall responsibility for establishment and oversight of the Company's risk management framework. To assist the Board in discharging its oversight responsibility, the management has been made responsible for identifying, monitoring and managing the company's financial risk exposure. The Company's overall risk management program focuses on the under predictability of financial markets and seek to minimize potential adverse effects on the Company's financial performance.

b) Credit risk

Credit risk is a risk that one party to a financial instrument will fail to discharge an obligation and cause the other party to incur a financial loss, without taking into account the fair value of any collateral. Concentration of credit risk arises when a number of financial instruments or contracts are entered into with same party, or when counter parties are engaged in similar business activities, or activities in the same geographical region, or have similar economic features that would cause their ability to meet contractual obligations to be similarly effected by change in economics, political or other conditions. Concentration of credit risk indicate the relative sensitivity of the Company's performance to developments affecting a particular industry.

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At the reporting date, the Company's total credit risk was concentrated in the following industrial / economic sectors:

	2023	
	Rupees	%
Interest income receivable	**1,052**	**1%**
Bank balance	**137,181**	**99%**
	138,233	**100%**

	2022	
	Rupees	%
Interest income receivable	1,237	1%
Bank balance	239,717	99%
	240,954	100%

	2023	2022
	Rupees	Rupees
The maximum exposure to credit risk at the reporting date is:		
Interest income receivable	**1,052**	1,237
Bank balance	**137,181**	239,717
	138,233	240,954

The credit quality of assets that are neither past due nor impaired can be assessed by reference to historical information and external credit ratings or to historical counterparty default rates.

The credit risk on bank balances is limited because the counter parties are banks with reasonably high credit ratings.

The credit quality of bank balances are as follows:

	Short term rating	**Rating agency**	**2023 Rupees**	2022 Rupees
Balances with banks				
- Bank Al Habib Limited	A1+	PACRA	**9,046**	14,046
- Meezan Bank Limited	A1+	JCR - VIS	**128,135**	225,671
			137,181	239,717

Due to the Company's long standing business relationships with this counterparty and after giving due consideration to its strong financial standing, management does not expect non-performance by this counter party on its obligations to the Company. Accordingly, the credit risk is minimal.

c) **Liquidity risk management**

Liquidity risk is the risk that the Company will encounter difficulty in meeting its financial obligations as they fall due. Liquidity risk arises because of the possibility that the Company could be required to pay its liabilities earlier than expected or may face difficulty in raising funds to meet commitments associated with financial liabilities as they fall due.

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The Company is exposed to liquidity risk in respect of trade and other payable.

The Company's approach to manage liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Company's reputation.

The table below analyses Company's financial liabilities into relevant maturity groupings based on the remaining period at the balance sheet date to maturity date and represents the undiscounted cash flows. The amounts in the table are the gross nominal undiscounted cash flows.

	2023			
	Carrying amount	**Contractual cash flows**	**Within one year**	**One to five years**
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	**114,290**	**114,290**	**114,290**	-

	2022			
	Carrying amount	Contractual cash flows	Within one year	One to five years
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	106,290	106,290	106,290	-

d) Market risk

Market risk is the risk that changes in market interest rates, equity prices, foreign exchange rates and credit spreads (not relating to changes in the obligor's / issuer's credit standing) will affect the Company's income or the value of its holdings of financial instruments. The objective of market risk management is to manage and control market risk exposures within acceptable parameters, while optimizing the return on risk.

e) Interest rate risk management

Interest / mark up rate risk management arises from the possibility of changes in interest / mark up rates which may affect the value of financial instruments. At the balance sheet date the Company is not exposed to any interest rate risk.

f) Capital risk management

The objective of the Company when managing capital is to safeguard its ability to continue as a going concern so that it can continue to provide returns for shareholders and to maintain a strong base to support the sustained development of its business.

The Company manages its capital structure by monitoring return on net assets and make adjustments to it in the light of changes in economic conditions.

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The Company finances its expansion projects through equity, borrowings and management of its working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

12 FAIR VALUES OF FINANCIAL INSTRUMENTS

Fair value is the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The carrying values of financial assets and liabilities reflected in the financial statements approximate their fair values.

Financial assets which are tradable in an open market are revalued at the market prices prevailing on the balance sheet date. The estimated fair value of financial assets and liabilities considered not significantly different from their book value.

Fair value hierarchy

The different level have been defined as follows:

- Quoted prices (unadjusted) in active markets for identical assets or liabilities (level 1);
- Inputs other than quoted prices included within level 1 that are observable for the asset or liability, either directly (i.e as prices) or indirectly (i.e derivede from prices) Level 2 ; and
- Inputs for the asset or liability that are not based on observable market data (level 3).

There were no transfers amongst levels during the year.

13 RELATED PARTY TRANSACTIONS

Related parties comprise associated companies, companies where directors also hold directorship, retirement benefits fund and key management personnel. The related parties with whom the Company had entered into transactions or had arrangements / agreements in place during the year have been disclosed below along with their basis of relationship and percentage shareholding in the Company:

Name of related party	Basis of relationship	%age of shareholding of the Company
Mr. Nadeem Malik	Director	33.34%
Mr. Najeeb Malik	Director	33.33%
Mr. Shahzad Malik	Director	33.33%

14 NUMBER OF EMPLOYEES

Total number of employees as at the end of the year	-	-
Average number of employees during the year	-	-

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15 GENERAL

15.1 Figures have been rounded off to the nearest Rupee.

15.2 The comparative figures have been re-arranged or re-classified wherever necessary for the purpose of better presentation.

16 AUTHORISATION

These Financial statements were approved by the Board of Directors in their meeting held on 06 OCT 2023

Chief Executive **Director**

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RAO & COMPANY
CHARTERED ACCOUNTANTS

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INDEPENDENT AUDITOR'S REPORT

To the members of Master Solar Energy Limited

Report on the Audit of the Financial Statements

Opinion

We have audited the annexed financial statements of Master Solar Energy Limited (the Company), which comprise the statement of financial position as at June 30, 2022 and the statement of profit or loss and other comprehensive income, the statement of changes in equity, the statement of cash flows 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, the statement of profit or loss and other comprehensive income, the statement of changes in equity and the statement of cash flows together with the notes forming parts thereof conform with accounting and reporting standards as applicable in Pakistan and give the information required by the Companies Act, 2017 (XIX of 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, 2022 and of the loss, 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 the International Ethics Standards Board for Accountants' Code of Ethics for Professional Accountants as adopted by the Institute of Chartered Accountants of Pakistan (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.

Information Other than the Financial Statements and Auditor's Report Thereon

Management is responsible for the other information. The other information comprises the information included in the annual report, but does not include the financial statements and our auditor's report thereon.

Our opinion on the financial statements does not cover the other information and we do not express any form of assurance conclusion thereon.

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In connection with our audit of the financial statements, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial statements or our knowledge obtained in the audit or otherwise appears to be materially misstated. If, based on the work we have performed, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

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 accounting and reporting standards as applicable in Pakistan and the requirements of Companies Act, 2017 (XIX of 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 operations, 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 judgement 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

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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.

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 (XIX of 2017);

b) the statement of financial position, the statement of profit or loss and other comprehensive income, 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 (XIX of 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 (XVIII of 1980).

The engagement partner on the audit resulting in this independent auditor's report is Abdul Rafay.

Rao & Company
Chartered Accountants
Rahim Yar Khan

Date: 07 October 2022
UDIN: AR2022102670oiz8ekC3

MASTER SOLAR ENERGY LIMITED
STATEMENT OF FINANCIAL POSITION
As at June 30, 2022

	Note	2022 Rupees	2021 Rupees
ASSETS			
NON-CURRENT ASSETS			
Property, plant and equipment	4	**3,776,862**	3,776,862
CURRENT ASSETS			
Tax refunds due from government	5	**7,774**	6,026
Interest income receivable		**1,237**	752
Cash and bank balance	6	**240,428**	330,421
		249,439	337,199
		4,026,301	4,114,061
EQUITY AND LIABILITIES			
SHARE CAPITAL AND RESERVES			
Authorised share capital			
10,000 ordinary shares of Rs. 1,000 each (2021: 10,000)		**10,000,000**	10,000,000
Issued, subscribed and paid up capital			
900 (2021: 900) Ordinary share of Rs. 1,000 each fully paid in cash		**900,000**	900,000
Loan from director	7	**3,777,500**	3,777,500
Accumulated loss		**(757,489)**	(668,714)
		3,920,011	4,008,786
CURRENT LIABILITIES			
Trade and other payables	8	**106,290**	105,275
CONTINGENCIES AND COMMITMENTS	9		
		4,026,301	4,114,061

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

MASTER SOLAR ENERGY LIMITED

STATEMENT OF PROFIT OR LOSS AND OTHER COMPREHENSIVE INCOME

For the year ended June 30, 2022

	Notes	2022 Rupees	2021 Rupees
Administrative expenses			
Fees and subscription		**(915)**	(5,175)
Auditors' remuneration		**(100,000)**	(100,000)
Operating loss		**(100,915)**	(105,175)
Interest income on deposit account		**12,140**	9,832
Loss for the year		**(88,775)**	(95,343)
Other comprehensive income / (loss)		**-**	-
Total comprehensive loss		**(88,775)**	(95,343)

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

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MASTER SOLAR ENERGY LIMITED
STATEMENT OF CASH FLOWS
For the year ended June 30, 2022

	Notes	2022 Rupees	2021 Rupees
CASH FLOWS FROM OPERATING ACTIVITIES			
Loss for the year		**(88,775)**	(95,343)
Operating loss before working capital changes		**(88,775)**	(95,343)
Working Capital Changes			
(Increase) / decrease in current assets			
Interest income receivable		**(485)**	349
Increase in current liabilities			
Trade and other payables		**1,015**	835
Cash used in operations		**(88,245)**	(94,159)
Income tax paid		**(1,748)**	(1,527)
Net cash outflow from operating activities		**(89,993)**	(95,686)
CASH FLOWS FROM INVESTING ACTIVITIES		**-**	-
CASH FLOWS FROM FINANCING ACTIVITIES		**-**	-
Net decrease in cash and cash equivalents		**(89,993)**	(95,686)
Cash and cash equivalents at the beginning of the year		**330,421**	426,107
Cash and cash equivalents at the end of the year		**240,428**	330,421

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

MASTER SOLAR ENERGY LIMITED
STATEMENT OF CHANGES IN EQUITY
For the year ended June 30, 2022

	Issued, subscribed and paid-up capital	Loan from directors	Accumulated loss	Total
	Rupees			
Balance at June 30, 2020	900,000	3,777,500	(573,371)	4,104,129
Loss for the year	-	-	(95,343)	(95,343)
Balance at June 30, 2021	900,000	3,777,500	(668,714)	4,008,786
Loss for the year	-	-	(88,775)	(88,775)
Balance at June 30, 2022	**900,000**	**3,777,500**	**(757,489)**	**3,920,011**

The annexed notes 1 to 16 form an integral part of these financial statements.

Chief Executive **Director**

MASTER SOLAR ENERGY LIMITED
NOTES TO THE FINANCIAL STATEMENTS
For the year ended June 30, 2022

1 Corporate and general information

1.1 Legal status and operations

Master Solar Energy Limited (the 'Company') was incorporated on May 28, 2015, as public limited company under the Companies Ordinance, 1984 (Repealed with enactment of the Companies Act, 2017).

The Company's principal objective is to carry on the business of supplying general electric power and to setup and operate solar power generation projects to generate, accumulate, distribute and supply electricity.

The geographical location and address of the company's business units, including plant is as under.

- The registered office of the Company is situated at Master House, 82 C - 1, Gulberg III, Lahore.

The Company is under consideration to develop solar powered plant.

2 BASIS OF PREPRATION

2.1 Statement of compliance

These financial statements have been prepared in accordance with the accounting and reporting standards as applicable in Pakistan for financial reporting. The accounting and reporting standards as applicable in Pakistan comprise of such International Financial Reporting Standards (IFRS Standards), issued by International Accounting Standard Board (IASB) as notified under Companies Act, 2017 (the "Act"); and provisions of and directives issued under the Act. Where the provisions of and directives issued under the Companies Act, 2017 differ from the IFRS standards, the provisions of and directives issued under the Companies Act, 2017 have been followed.

2.2 Basis of measurement

These financial statements have been prepared under the historical cost convention as per accounting policies consistently applied during the period except as other wise stated in the respective policies and notes given hereunder.

2.3 Functional and presentation currency

These financial statements are presented in Pak Rupees, which is the functional and presentation currency of the Company. Amounts presented in the financial statements have been rounded off to the nearest of Rupee unless otherwise stated.

2.4 Key judgements and estimates

The preparation of financial statements in conformity with the accounting and reporting standards as applicable in Pakistan requires the use of certain critical accounting estimates.

In addition, it requires management to exercise judgement in the process of applying the Company's accounting policies. The areas involving a high degree of judgement or complexity, or areas where assumptions and estimates are significant to the financial statements, are documented in the following accounting policies and notes, and relate primarily to:

- Capital work in process – Note 3.1
- Trade debts – Note 3.2
- Estimation of provisions - Note 3.7
- Current income tax expense and provision for current tax - Note 3.8

The revisions to accounting estimates (if any) are recognised 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.

2.5 Change in accounting standards, interpretations and amendments to published approved accounting standards

a) Standards, interpretations and amendments to published approved accounting standards that are effective.

Interest Rate Benchmark Reform – Phase 2 which amended IFRS 9, IAS 39, IFRS 7, IFRS 4 and IFRS 16 is applicable for annual financial periods beginning on or after 1 January 2021, with earlier application permitted. The amendments introduce a practical expedient to account for modifications of financial assets or financial liabilities if a change results directly from IBOR reform and occurs on an 'economically equivalent' basis. In these cases, changes will be accounted for by updating the effective interest rate. A similar practical expedient will apply under IFRS 16 for lessees when accounting for lease modifications required by IBOR reform. The amendments also allow a series of exemptions from the regular, strict rules around hedge accounting for hedging relationships directly affected by the interest rate benchmark reforms. The amendments apply retrospectively with earlier application permitted. Hedging relationships previously discontinued solely because of changes resulting from the reform will be reinstated if certain conditions are met.

b) The following International Financial Reporting Standards (IFRS Standards) as notified under the Companies Act, 2017 and the amendments and interpretations thereto will be effective for accounting periods beginning on or after 1 July 2022:

- Onerous Contracts – Cost of Fulfilling a Contract (Amendments to IAS 37) effective for the annual periods beginning on or after 1 January 2022 clarifies that the 'cost of fulfilling a contract' for the purposes of the onerous contract assessment comprises the costs that relate directly to the contract, including both the incremental costs and an allocation of other direct costs to fulfil the contract. An entity is required to apply the amendments to contracts for which it has not yet fulfilled all its obligations at the beginning of the annual reporting period in which it first applies the amendments (the date of initial application). Restatement of comparative information is not required, instead the amendments require an entity to recognize the cumulative effect of initially applying the amendments as an adjustment to the opening balance of retained earnings or other component of equity, as appropriate, at the date of initial application.

The following annual improvements to IFRS Standards 2018-2020 are effective for annual reporting periods beginning on or after 1 January 2022.

- IFRS 9 – The amendment clarifies that an entity includes only fees paid or received between the entity (the borrower) and the lender, including fees paid or received by either the entity or the lender on the other's behalf, when it applies the '10 per cent' test in paragraph B3.3.6 of IFRS 9 in assessing whether to derecognize a financial liability.

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- IFRS 16 – The amendment partially amends Illustrative Example 13 accompanying IFRS 16 by excluding the illustration of reimbursement of leasehold improvements by the lessor. The objective of the amendment is to resolve any potential confusion that might arise in lease incentives.

- Property, Plant and Equipment: Proceeds before Intended Use (Amendments to IAS 16) effective for annual periods beginning on or after 1 January 2022 clarifies that sales proceeds and costs of items produced while bringing an item of property, plant and equipment to the location and condition necessary for it to be capable of operating in the manner intended by management e.g. when testing etc., are recognized in profit or loss in accordance with applicable Standards. The entity measures the cost of those items applying the measurement requirements of IAS 2. The standard also removes the requirement of deducting the net sales proceeds from cost of testing. An entity shall apply those amendments retrospectively, but only to items of property, plant and equipment that are brought to the location and condition necessary for them to be capable of operating in the manner intended by management on or after the beginning of the earliest period presented in the financial statements in which the entity first applies the amendments. The entity shall recognize the cumulative effect of initially applying the amendments as an adjustment to the opening balance of retained earnings (or other components of equity, as appropriate) at the beginning of that earliest period presented.

- Reference to the Conceptual Framework (Amendments to IFRS 3) - Reference to the Conceptual Framework, issued in May 2020, amended paragraphs 11, 14, 21, 22 and 23 of and added paragraphs 21A, 21B, 21C and 23A to IFRS 3. An entity shall apply those amendments to business combinations for which the acquisition date is on or after the beginning of the first annual reporting period beginning on or after 1 January 2022.

- Classification of liabilities as current or non-current (Amendments to IAS 1) amendments apply retrospectively for the annual periods beginning on or after 1 January 2023. These amendments in the standards have been added to further clarify when a liability is classified as current. The standard also amends the aspect of classification of liability as non-current by requiring the assessment of the entity's right at the end of the reporting period to defer the settlement of liability for at least twelve months after the reporting period. An entity shall apply those amendments retrospectively in accordance with IAS 8.

- Disclosure of Accounting Policies (Amendments to IAS 1 and IFRS Practice Statement 2) – the IASB has issued amendments on the application of materiality to disclosure of accounting policies and to help companies provide useful accounting policy disclosures. The key amendments to IAS 1 include:

  - requiring companies to disclose their material accounting policies rather than their significant accounting policies;

  - clarifying that accounting policies related to immaterial transactions, other events or conditions are themselves immaterial and as such need not be disclosed; and

  - clarifying that not all accounting policies that relate to material transactions, other events or conditions are themselves material to a company's financial statements.

The Board also amended IFRS Practice Statement 2 to include guidance and two additional examples on the application of materiality to accounting policy disclosures. The amendments are effective for annual reporting periods beginning on or after 1 January 2023 with earlier application permitted.

RAD

Definition of Accounting Estimates (Amendments to IAS 8) introduce a new definition for accounting estimates clarifying that they are monetary amounts in the financial statements that are subject to measurement uncertainty. The amendments also clarify the relationship between accounting policies and accounting estimates by specifying that an entity develops an accounting estimate to achieve the objective set out by an accounting policy. The amendments are effective for periods beginning on or after 1 January 2023, with earlier application permitted, and will apply prospectively to changes in accounting estimates and changes in accounting policies occurring on or after the beginning of the first annual reporting period in which the company applies the amendments.

Deferred Tax related to Assets and Liabilities arising from a Single Transaction (Amendments to IAS 12) narrow the scope of the initial recognition exemption (IRE) so that it does not apply to transactions that give rise to equal and offsetting temporary differences. As a result, companies will need to recognize a deferred tax asset and a deferred tax liability for temporary differences arising on initial recognition of a lease and a decommissioning provision. For leases and decommissioning liabilities, the associated deferred tax asset and liabilities will need to be recognized from the beginning of the earliest comparative period presented, with any cumulative effect recognized as an adjustment to retained earnings or other components of equity at that date. The amendments are effective for annual reporting periods beginning on or after 1 January 2023 with earlier application permitted.

Sale or Contribution of Assets between an Investor and its Associate or Joint Venture (Amendments to IFRS 10 and IAS 28) - The amendment amends accounting treatment on loss of control of business or assets. The amendments also introduce new accounting for less frequent transaction that involves neither cost nor full step-up of certain retained interests in assets that are not businesses. The effective date for these changes has been deferred indefinitely until the completion of a broader review.

The Company is in the process of assessing the impact of the above amendments and improvements.

3 SIGNIFICANT ACCOUNTING POLICIES

The significant accounting policies consistently applied in the preparation of these financial statements are the same as those applied in earlier periods presented.

3.1 Capital work in progress

Capital work-in-progress is stated at cost less any identified impairment loss. All expenditure connected with specific assets incurred during installation and construction period are carried under capital work-in-progress. These are transferred to operating fixed assets as and when these are available for use.

3.2 Trade debts, loans, advances, deposits and other receivables

These are initially measured at the fair value of the consideration receivable. Subsequently these are valued at amortized cost. These assets are written off when there is no reasonable expectation of recovery. Credit loss is based on the expected credit loss.

3.3 Cash and cash equivalents

Cash and cash equivalents are carried in the statement of financial position at cost. For the purpose of Cash Flow Statement, cash and cash equivalent comprise cash in hand and cash with banks.

RAD

3.4 Loan from directors

Loan from director is accounted for by using Technical Release-32 "Accounting Directors' Loan" (TR 32) issued by the Institute of Chartered Accountants of Pakistan (ICAP) on 25 January 2016 which provided specific guidance on Director's loan that are interest free and repayable at the discretion of the entity. Loan from director is accounted for as per clause 3.3.1 of TR 32 which states that "A loan to an entity by the director which is agreed to be paid at the discretion of the entity does not pass the test of liability and is to be recorded as equity at face value. This is not subsequently remeasured.

3.5 Financial instruments

Financial assets

Initial measurement

The Company classifies its financial assets in to following

- fair value through other comprehensive income (FVOCI);
- fair value through profit or loss (FVTPL); and
- measured at amortized cost.

A financial asset is initially measured at fair value plus, for an item not at FVTPL, transaction costs that are directly attributable to its acquisition.

Subsequent measurement

Debt investments at FVOCI

These assets are subsequently measured at fair value. Interest / markup income calculated using the effective interest method, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss. Other net gains and losses are recognized in other comprehensive income. On de-recognition, gains and losses accumulated in other comprehensive income are reclassified to the statement of profit or loss.

Equity investments at FVOCI

These assets are subsequently measured at fair value. Dividends are recognized as income in the statement of profit or loss unless the dividend clearly represents a recovery of part of the cost of the investment. Other net gains and losses are recognized in other comprehensive income and are never reclassified to the statement of profit or loss.

Financial assets at FVTPL

These assets are subsequently measured at fair value. Net gains and losses, including any interest / markup or dividend income, are recognized in statement of profit or loss.

Financial assets measured at amortized cost

These assets are subsequently measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, foreign exchange gains and losses and impairment are recognized in the statement of profit or loss.

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Short term investments

Investment in Term deposits is classified as amortized cost and are initially measured at fair value. Transaction costs directly attributable to the acquisition are included in the carrying amount. Subsequently these investments are measured at amortized cost using the effective interest method. The amortized cost is reduced by impairment losses. Interest / markup income, losses and impairment are recognized in the statement of profit or loss.

Impairment of financial assets

The Company recognizes loss allowances for ECLs in respect of financial assets measured at amortized cost.

The Company measures loss allowances at an amount equal to lifetime ECLs, except for the following, which are measured at 12-month ECLs:

- debt securities that are determined to have low credit risk at the reporting date; and
- other debt securities and bank balance for which credit risk (i.e. the risk of default occuring over the expected life of the financial instrument) has not increased significantly since initial recognition.

Loss allowances for trade receivables are always measured at an mount equal to lifetime ECLs.

When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECLs, the Company considers reasonable and supportable information that is relevant and available without undue cost or effort. This includes both quantitative and quantitative information and analysis, based on the Company's historical experience and informed credit assessment and including forward-looking information.

The Company assumes that the credit risk on a financial asset has increased significantly if it is more than past due for a reasonable period of time. Lifetime ECLs are the ECLs that result from all possible default events over the expected life of a financial instrument. 12-month ECLs are the portion of ECLs that result from default events that are possible within the 12 months after the reporting date (or a shorter period if the expected life of the instrument is less than 12 months). The maximum period considered when estimating ECLs is the maximum contractual period over which the Company is exposed to credit risk.

Loss allowances for financial assets measured at amortized cost are deducted from the Gross carrying amount of the assets.

The Gross carrying amount of a financial asset is written off when the Company has no reasonable expectations of recovering of a financial asset in its entirety or a portion thereof. The Company individually makes an assessment with respect to the timing and amount of write-off based on whether there is a reasonable expectation of recovery. The Company expects no significant recovery from the amount written off. However, financial assets that are written off could still be subject to enforcement activities in order to comply with the Company's procedures for recovery of amounts due.

De-recognition

Financial assets are derecognized when the rights to receive cash flows from the financial assets have expired or have been transferred and the Company has transferred substantially all risks and rewards of ownership.

RAD

Financial liabilities

Financial liabilities are classified as measured at amortized cost or 'at fair value through profit or loss' (FVTPL). A financial liability is classified as at FVTPL if it is classified as held for trading, it is a derivative or it is designated as such on initial recognition. Financial liabilities at FVTPL are measured at fair value and net gains and losses, including any interest expense, are recognized in the statement of profit or loss.

Other financial liabilities are subsequently measured at amortized cost using the effective interest method. Interest expense and foreign exchange gains and losses are recognized in the statement of profit or loss. Any gain or loss on de-recognition is also recognized in the statement of profit or loss.

Financial liabilities are derecognized when the contractual obligations are discharged or cancelled or have expired or when the financial liability's cash flows have been substantially modified.

Offsetting of financial assets and financial liabilities

Financial assets and financial liabilities are set off and only the net amount is reported in the statement of financial position when there is a legally enforceable right to set off the recognized amount and the Company intends to either settle on a net basis, or to realize the asset and settle the liability simultaneously.

3.6 Trade and other payables

Liabilities for trade and other amounts payable are carried at cost which is the fair value of the consideration to be paid in the future for goods and services received, whether or not billed to the Company.

3.7 Provisions

A provision is recognized in the statement of financial position when the Company has a present legal or constructive obligation as a result of past event and it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation of which reliable estimate can be made. The expense relating to provision is presented in statement of comprehensive income net of any reimbursements. The management expects that time value of money is not material and no discounting of provision is made by the Company.

3.8 Taxation

Current

The profits and gains of the company derived from electric power generation are exempt from tax in terms of Clause (132) of Part I of the Second Schedule to the Income Tax Ordinance, 2001, subject to the conditions and limitations provided therein.

Under clause (11A) of Part IV of the Second Schedule to the Income Tax Ordinance, 2001, the company is also exempt from levy of minimum tax on 'turnover' under section 113 of the Income Tax Ordinance, 2001. However, full provision is made in the profit and loss account on income from sources not covered under the above clauses at current rates of taxation after taking into account tax credits and rebates available, if any.

RAD

Deferred

Deferred tax is accounted for using the statement of financial position liability method in respect of all temporary differences arising from differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of the taxable profit. However, the deferred tax is not accounted for if it arises from initial recognition of an asset or liability in a transaction other than a business combination that at the time of transaction neither affects accounting nor taxable profit or loss. Deferred tax liabilities are generally recognised for all taxable temporary differences and deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which the deductible temporary differences, unused tax losses and tax credits can be utilised.

Deferred tax is calculated at the rates that are expected to apply to the period when the differences reverse based on tax rates that have been enacted or substantively enacted by the statement of financial position date. Deferred tax is charged or credited in the profit and loss account, except in the case of items credited or charged to equity in which case it is included in equity.

Deferred tax has not been provided in these financial statements as the company's management believes that the temporary differences will not reverse in the foreseeable future due to the fact that the profits and gains of the company derived from electric power generation are exempt from tax subject to the conditions and limitations provided for in terms of clause (132) of Part I of the Second Schedule to the Income Tax Ordinance, 2001.

3.9 Mark-up bearing borrowings and borrowing cost

Mark-up bearing borrowings are recognized initially at fair value, less attributable transaction cost. Subsequent to initial recognition, mark up bearing borrowings are stated at amortized cost, while the difference between the cost (reduced for periodic payments) and redemption value is recognized in the statement of profit or loss account over the period of the borrowings using the effective interest method. Borrowing costs are recognised as an expense in the period in which these are incurred, except that those which are directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale) are capitalized as part of the cost of that asset.

3.10 Foreign exchange

Foreign currency transactions are recorded at the exchange rate applicable at the transactions date. Monetary assets & liabilities are translated into Rupees using exchange rates applicable at the statement of financial position date. All gains and losses on settlement and transaction at year end are recognised in profit and loss account.

3.11 Impairment

The carrying amount of the Company's assets are reviewed at each statement of financial position date to determine whether there is any indication of impairment loss. If such evidence exists, the recoverable amount of assets is estimated in order to determine the extent of the impairment loss, if any. Impairment losses are recognized as expense in profit and loss account.

RAD

	Note	2022 Rupees	2021 Rupees
4 PROPERTY, PLANT AND EQUIPMENT			
Capital work in progress		**3,776,862**	3,776,862
5 TAX REFUNDS DUE FROM GOVERNMENT			
Advance income tax		**1,748**	1,527
Income tax refundable		**6,026**	4,499
		7,774	6,026
6 CASH AND BANK BALANCE			
Cash in hand		**711**	660
Current account		**14,046**	14,096
Saving account		**225,671**	315,665
		239,717	329,761
		240,428	330,421

6.1 The balance in saving accounts carry mark up at the rates from 2.80 % to 6.50% per annum (2021 : 2.75% to 2.90% per annum)

7 LOAN FROM DIRECTOR			
Loan from director			
Mr. Nadeem Malik	7.1	**1,070,000**	1,070,000
Mr. Najeeb Malik	7.1	**1,070,000**	1,070,000
Mr. Shahzad Malik	7.1	**1,637,500**	1,637,500
		3,777,500	3,777,500

7.1 This represent unsecured and interest free loan from director of the Company, the loan is repayable at the discretion of the Company.

8 TRADE AND OTHER PAYABLES		
Audit fee payable	**100,000**	100,000
Other payables	**6,290**	5,275
	106,290	105,275

9 CONTINGENCIES AND COMMITMENTS

There were no contingencies and commitments to report at the year end (2021: Nil).

RAD

10 REMUNERATION OF CHIEF EXECUTIVE, DIRECTORS AND EXECUTIVES

No remuneration were paid to the Executive, Chief Executive or any of the directors of the Company.

11 FINANCIAL INSTRUMENTS AND RISK MANAGEMENT

The Company finances its operations through equity, borrowing and management of working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

Taken as a whole the Company's risk arising from financial instruments is limited as there is no significant exposure to price and cash flow risk in respect of such instruments. Financial instruments of the Company are as under:

	2022 Rupees	2021 Rupees
Financial Instruments by category		
Financial assets at amortised cost		
Interest income receivable	**1,237**	752
Cash and bank balance	**240,428**	330,421
	241,665	331,173
Financial liabilities at amortised cost		
Trade and other payables	**106,290**	105,275

a) Financial risk management objectives

The Company has exposure to the following risks from financial instruments:

- Credit risk
- Liquidity risk
- Market risk

The Board of Directors of the Company has the overall responsibility for establishment and oversight of the Company's risk management framework. To assist the Board in discharging its oversight responsibility, the management has been made responsible for identifying, monitoring and managing the company's financial risk exposure. The Company's overall risk management program focuses on the under predictability of financial markets and seek to minimize potential adverse effects on the Company's financial performance.

b) Credit risk

Credit risk is a risk that one party to a financial instrument will fail to discharge an obligation and cause the other party to incur a financial loss, without taking into account the fair value of any collateral. Concentration of credit risk arises when a number of financial instruments or contracts are entered into with same party, or when counter parties are engaged in similar business activities, or activities in the same geographical region, or have similar economic features that would cause their ability to meet contractual obligations to be similarly effected by change in economics, political or other conditions. Concentration of credit risk indicate the relative sensitivity of the Company's performance to developments affecting a particular industry.

At the reporting date, the Company's total credit risk was concentrated in the following industrial / economic sectors:

RAD

	2022	
	Rupees	**%**
Interest income receivable	**1,237**	**1%**
Bank balance	**239,717**	**99%**
	240,954	**100%**

	2021	
	Rupees	%
Interest income receivable	752	0%
Bank balance	329,761	100%
	330,513	100%

	2022	2021
	Rupees	Rupees
The maximum exposure to credit risk at the reporting date is:		
Interest income receivable	**1,237**	752
Cash and bank balance	**240,428**	330,421
	241,665	331,173

The credit quality of assets that are neither past due nor impaired can be assessed by reference to historical information and external credit ratings or to historical counterparty default rates.

The credit risk on bank balances is limited because the counter parties are banks with reasonably high credit ratings.

The credit quality of bank balances are as follows:

	Short term rating	**Rating agency**	**2022 Rupees**	2021 Rupees
Balances with banks				
- Bank Al Habib Limited	AA+	PACRA	**14,046**	14,096
- Meezan Bank Limited	AA+	JCR - VIS	**225,671**	315,665
			239,717	329,761

Due to the Company's long standing business relationships with this counterparty and after giving due consideration to its strong financial standing, management does not expect non-performance by this counter party on its obligations to the Company. Accordingly, the credit risk is minimal.

c) **Liquidity risk management**

Liquidity risk is the risk that the Company will encounter difficulty in meeting its financial obligations as they fall due. Liquidity risk arises because of the possibility that the Company could be required to pay its liabilities earlier than expected or may face difficulty in raising funds to meet commitments associated with financial liabilities as they fall due.

The Company is exposed to liquidity risk in respect of non-current interest bearing liabilities, short term borrowings, trade and other payable and accrued mark up.

The Company's approach to manage liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Company's reputation.

The table below analyses Company's financial liabilities into relevant maturity groupings based on the remaining period at the balance sheet date to maturity date and represents the undiscounted cash flows. The amounts in the table are the gross nominal undiscounted cash flows.

	2022			
	Carrying amount	Contractual cash flows	Within one year	One to five years
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	106,290	106,290	106,290	-

	2021			
	Carrying amount	Contractual cash flows	Within one year	One to five years
	Rupees			
Non - derivative financial liabilities				
Trade and other payables	105,275	105,275	105,275	-

d) **Market risk**

Market risk is the risk that changes in market interest rates, equity prices, foreign exchange rates and credit spreads (not relating to changes in the obligor's / issuer's credit standing) will affect the Company's income or the value of its holdings of financial instruments. The objective of market risk management is to manage and control market risk exposures within acceptable parameters, while optimizing the return on risk.

e) **Interest rate risk management**

Interest / mark up rate risk management arises from the possibility of changes in interest / mark up rates which may affect the value of financial instruments. The Company has long term finance and short term borrowing at variable rates. At the balance sheet date the Company is not exposed to any interest rate risk.

RAD

f) **Capital risk management**

The objective of the Company when managing capital is to safeguard its ability to continue as a going concern so that it can continue to provide returns for shareholders and to maintain a strong base to support the sustained development of its business.

The Company manages its capital structure by monitoring return on net assets and make adjustments to it in the light of changes in economic conditions. In order to maintain or adjust the capital structure, the Company may adjust the amount of dividend payable to the shareholders or issue new shares.

The Company finances its expansion projects through equity, borrowings and management of its working capital with a view to maintain an appropriate mix between various sources of finance to minimize risk.

12 FAIR VALUES OF FINANCIAL INSTRUMENTS

Fair value is the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The carrying values of financial assets and liabilities reflected in the financial statements approximate their fair values.

Financial assets which are tradable in an open market are revalued at the market prices prevailing on the balance sheet date. The estimated fair value of financial assets and liabilities considered not significantly different from their book value.

Fair value hierarchy

The different level have been defined as follows:

- Quoted prices (unadjusted) in active markets for identical assets or liabilities (level 1);
- Inputs other than quoted prices included within level 1 that are observable for the asset or liability, either directly (i.e as prices) or indirectly (i.e derivede from prices) Level 2 ; and
- Inputs for the asset or liability that are not based on observable market data (level 3).

There were no transfers amongst levels during the year.

13 RELATED PARTY TRANSACTIONS

Related parties comprise associated companies, companies where directors also hold directorship, retirement benefits fund and key management personnel. The related parties with whom the Company had entered into transactions or had arrangements / agreements in place during the year have been disclosed below along with their basis of relationship and percentage shareholding in the Company:

Name of related party	Basis of relationship	%age of shareholding of the Company
Mr. Nadeem Malik	Director	33.34%
Mr. Najeeb Malik	Director	33.33%
Mr. Shahzad Malik	Director	33.33%

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14 NUMBER OF EMPLOYEES

Total number of employees as at the end of the year	-	-
Average number of employees during the year	-	-

15 GENERAL

15.1 Figures have been rounded off to the nearest Rupee.

15.2 The comparative figures have been re-arranged or re-classified wherever necessary for the purpose of better presentation.

16 AUTHORISATION

These Financial statements were approved by the Board of Directors in their meeting held on 07 OCT 2022

Chief Executive

Director

RAD

ANNEXURE – E
FORM A

RND

Form-A

THE COMPANIES ACT, 2017
THE COMPANIES REGULATIONS, 2024

[Section 130(1),130(2),424(5) read with Regulations 62 & 30]

ANNUAL RETURN OF A COMPANY

PART I

(To be filled by All Companies)

1.1. CUIN (Registration Number) | 0 | 0 | 9 | 3 | 6 | 5 | 3 |

1.2. Name of the Company: MASTER SOLAR ENERGY LIMITED

1.3 Fee Payment Details 1.3.1 Challan No: 24181138 1.3.2 Amount (Rs.): 2200

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 an Active Company)

2.1. Annual General Meeting held on — Day: 28 Month: 10 year: 2024

2.2. Form-A made up to (applicable in case no AGM was held/concluded during the year) — Day: Month: year:

2.3. Registered office address: MASTER HOUSE, 54-DARUL AMAN, COOPERATIVE HOUSING SOCIETY, SHAHRAH-E-FAISAL, KARACHI, Jamshed Town, Karachi East, Sindh, Pakistan

2.4. Email Address: acct.off@master.com.pk

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2.5.	Office Tel No	+923008433159
2.6.	Mobile No. (Preferable WhatsApp enabled number) of authorized officer (Cheif Executive/Director/Company Secretary/Cheif Financial Officer)	+92 3420821153

2.7.

Authorized Share Capital (If applicable)			
Classes and kinds of Shares	No of Shares	Amount	Face Value
Ordinary Shares	10,000	10,000,000	1,000

2.8.

Paid up Share Capital (If applicable)			
Classes and kinds of Shares	No of Shares	Amount	Face Value
Ordinary/Ordinary	900	900,000	1,000

2.9. **Particulars of Officer(s) including Share Registrar**

S#.	Name	Designation	CNIC No.	Address
1	SHAHZAD MALIK	Chief Executive	3520192954157	HOUSE # 126-Y BLOCK STREET # 18, DHA LAHORE, Pakistan
2	AMIR MUSHTAQ BUTT	Company Secretary	3520230581041	82-C-1, GULBERG III, LAHORE, Pakistan
3		Chief Financial Officer		
4	QASIM KHAN	Legal Advisor	3520236767153	2-AZEEM HOUSE, 4 MOZANG ROAD, LAHORE, Pakistan
5	RAO AND COMPANY	Auditor		4 KARACHI CHAMBERS, HASRAT MOHANI ROAD, PO BOX 5061, KARACHI 2, Karachi, Karachi, Sindh, Pakistan
6		Share Registrar (if applicable)		
7		Any Other Officer		

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

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S #.	Name	Residential Address	Nationality	CNIC No for Pakistanis, or NICOP No for Overseas Pakistanis, or Passport No for foreigners	Date of appointment or election	Name of member or creditor nominating or appointing the director
1	MR. NAJEEB MALIK	HOUSE # 321, BLOCK K, PHASE II, DHA, LAHORE CANTT., Pakistan	Pakistan	3520130887873	28-10-2022	
2	SHAHZAD MALIK	HOUSE # 126-Y BLOCK STREET # 18, DHA LAHORE, Pakistan	Pakistan	3520192864157	28-10-2022	
3	MR. NADEEM MALIK	HOUSE # 75, KHAYABAN-E-SHAHEEN, PHASE VI, DHA, KARACHI, Pakistan	Pakistan	4230186564979	28-10-2022	

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

S #.	Folio # (if any)	Name	Address	Nationality	No of shares /debentures held	Percentage of shareholding of member having 25% or more shareholding	CNIC No for Pakistanis, or NICOP No for Overseas Pakistanis, or Passport No for foreigners, or CUIN No. for pakistani company , or Registration No. for foreign company

RAD

Shareholders/member							
1		MR. NAJEEB MALIK	HOUSE # 321, BLOCK K, PHASE II, DHA, LAHORE CANTT., Pakistan	Pakistan	300	33.33	3520130887873
2		SHAHZAD MALIK	HOUSE # 126-Y BLOCK STREET # 18, DHA LAHORE, Pakistan	Pakistan	300	33.33	3520192954157
3		MR. NADEEM MALIK	HOUSE # 75, KHAYABAN-E-SHAHEEN, PHASE VI, DHA, KARACHI, Pakistan	Pakistan	300	33.33	4230186564979
Debenture holders							

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

S#.	Name of Transferor	Name of Transferee	Number of shares transfered	Date of registration of transfer
	Shareholders/member			
	Debenture holders			

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PART III

(To be filled by an Inactive Company)

3.1. Correspondence Address	
3.2. Contact Details	

3.3. **List of Directors as on the date up to which the Form is made:**

S #.	Name	Residential Address	Nationality	No of shares held (if any)	CNIC No for Pakistanis, or NICOP No for Overseas Pakistanis, 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 :

i. not carried out any operation since grant of status as inactive company.

ii. no substantial assets or Accounting transactions.

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)	SHAHZAD MALIK	"Director, Chief Executive"
3.7. Signatures	This is an electronically generated document and doesnt require a physical form	

RAD

3.8. Registration No of Authorized Intermediary, if applicable

3.9. Date

Day		Month		year			
0	4	1	1	2	0	2	4

INSTRUCTIONS FOR FILLING THIS FORM

1. This Form shall be made up to the date of last 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 S. 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 S.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 Forms-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. 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

RAD

Meezan Bank
The Premier Islamic Bank

25 Years

Best Bank
2018, 2020 & 2023
Pakistan Banking Awards

28 JAN, 2025

To,

MASTER GROUP,

Account Maintenance Certificate

السلام علیکم ورحمتہ اللہ وبرکاتہ

This is to certify that **MASTER SOLAR ENERGY LIMITED** is maintaining **MEEZAN RUPEE SAVINGS ACCOUNT,** Account **0254-0103372931** with us since **02 OCT 2018.**

The above information is provided at the specific request of our customer without any risk. obligation and responsibility on the part of Meezan Bank Ltd. Pakistan, its authorized signatories or employees.

Ahsan Zafar Khan
Personal Banking Manager

Mobeen shahid
Operations Manager

Meezan Bank Ltd.
Zahoor Elahi Road Branch
Building No.3-A, Block A, Gulberg II. Zahoor Elahi Road, Lahore, Pakistan.
Tel: (92-042) 35987200 Fax: (92-042) 35786220 www.meezanbank.com

RAM

ANNEXURE – G
DETAILED PROFILE OF THE APPLICANT & SENIOR MANAGEMENT

RAD

MASTER

MASTER SOLAR ENERGY LIMITED

Management Credentials

BOARD OF DIRECTORS

❖ NADEEM MALIK – DIRECTOR

Mr. Nadeem Malik has been associated with the Group for the past 25 years and is a director and major stakeholder in the companies comprising the Master Group. He spearheaded the Group's expansion into the automotive sector, and is currently Managing Director of Procon Engineering (Private) Limited and Master Motor Corporation (Private) Limited. He holds a Bachelor's degree in Business Administration from the University of Southern California.

Professional Experience

Mr. Nadeem Malik specializes in and has extensive experience in the Automotive Industry and has been successfully running his business over a period spanning over 2 decades. He is currently managing director of Procon Engineering (Pvt) Ltd and Master Motor Corporation along with holding directorship in the Master Group companies in Pakistan as detailed below:

o **PROCON ENGINEERING (PVT) LTD** – ***Managing Director***

The year 1988 saw the foundation of PROCON ENGINEERING (PVT) LTD which rapidly grew to be a totally self-reliant composite manufacturing facility, with strength of over 250 engineers and technical staff. Since then PROCON ENGINEERING (PVT) LTD has always been at the forefront as an integral player in the industrialization of Pakistan. PROCON ENGINEERING (PVT) LTD is involved in the manufacture and supply of all type of automobile seats, sports car seats for export, door trims (molded & flat type), roof headlining (molded, suspended & perforated types), steering wheels, rear package tray , sun visors, fender liner, engine under cover, armrests and floor mats.

o **MASTER MOTOR CORPORATION** – ***Managing Director***

Master Motor Corporation has state-of-the-art technology at its newly built plant at Bin Qasim, Karachi. Master Motor Corporation is introducing 4.5 Ton, 3.5 Ton and 2 Ton light duty truck and medium size buses to be followed by a variety of models including medium and heavy-duty trucks and large buses.

Education

- O' Level from Cambridge University in 1979.
- Bachelor of Business Management from University of Southern California, LOS Angeles, U.S.A. in 1983.

❖ NAJEEB MALIK – DIRECTOR

Mr. Najeeb Malik has been associated with the Group for over twenty years. He was the driving force behind Master Group's diversification into the textile sector, and is currently Managing Director of Master Textile Mills Limited. He is also a major stakeholder and director of the other Master Group Companies. Mr. Najeeb Malik holds an engineering degree from University of Southern California.

Professional Experience

Mr. Najeeb Malik specializes in textile industry and has been successfully running his business for the last 2 decades. He is currently managing director of Master Textile Mills Ltd along with holding directorship in the Master Group companies in Pakistan as detailed below:

BAO

o **MASTER TEXTILE MILLS LIMITED – *Managing Director***

MTML was incorporated on February 13, 1992 as a private limited company under the Companies Ordinance, 1984 and was subsequently converted into a public limited company in 1992. MTML is a fully vertically integrated facility, with spinning, weaving, dyeing and garment divisions. It is one of the go-to choices manufacturing choices for international brands.

Education

- Master's degree in Engineering from University of Southern California, USA

❖ SHAHZAD MALIK – CHIEF EXECUTIVE OFFICER & DIRECTOR

Mr. Shahzad Malik, a young and enterprising businessman, started his career at Master Group in the core, foam products business. Since taking over, he has revamped the entire product line, expanded beyond Pakistan and updated the look of the Master brand to reflect the modern era and is currently Managing Director of Master Molty Foam and Group Energy Division.

Professional Experience

Mr. Shahzad Malik is also the driving force behind a new foam production facility (2015) at Raiwind, and the inauguration of the Marina Home store in Lahore. Recognising the potential of the wind power sector in Pakistan, Mr. Malik spearheaded Master Group's investment in the energy sector, and was responsible for development and successful achievement of commercial operations date of two wind power projects; 52.80 MW Master Wind Energy Limited and 50 MW Master Green Energy Limited, and is responsible for the management of these projects. As Managing Director, he favours a hand-on approach, which has given him extensive experience and insight into all aspects of wind power projects, from the pre-financial close process of financing, selection of EPC contractors and negotiating the project agreements, to the construction phase of coordinating on the ground activities.

o **MASTER MOLTY FOAM – *Managing Director***

Master Group of Industries is a pioneer of foam industry in Pakistan - since 1963 Master MoltyFoam has been manufacturing and providing inventive sleeping solutions offering ubiquitous health effects. Commitment to producing innovative problem-solving products, Master MoltyFoam launched Pakistan's first-ever healthcare and orthopedic sleeping solutions. The company takes pride in being the only foam manufacturer of the country that utilize top-class high-pressure technology to produce quality comfort solutions.

o **MASTER GROUP – ENERGY DIVISION – *Managing Director***

Master Group of Industries is one one of the key players of the renewable energy sector in Pakistan and is highly committed to partake in its growth in order for Pakistan to achieve energy security, reduce reliance on imported fuel and reach a lower energy basket price. The Group forayed into the renewable energy sector with its first 52.80 MW wind power project namely Master Wind Energy Limited situated in District Jhimpir, Sindh, which achieved Commercial Operations Date in October, 2016. Following the successful commencement of operations of Master Wind, the Group ventured into its second 50 MW wind power project Master Green Energy Limited located in District Jamshoro, Sindh which achieved Commercial Operations Date in August, 2021. MGI has also been declared as the First Ranked Bidder for development of a 99 MW Arkari Gol hydropower project in District Chitral, Khyber Pakhtunkhwa by Pakhtunkhwa Energy Development Organisation ("PEDO") and has been issued a Letter of Intent ("LOI") for development of a 50 MW wind power project Jamshed Wind Energy in District Jhimpir, Sindh by the Directorate of Alternative Energy Department Government of Sindh ("DAE-GOS").

Education

- Masters in Business Administration, Bentley Universities, USA
- Bachelors of Science (Finance), Bentley Universities, USA

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MASTER

MASTER SOLAR ENERGY LIMITED

Management Credentials

KEY MANAGEMENT

❖ RUMMAN ARSHAD DAR – CHIEF OPERATING OFFICER

Mr. Rumman has over 20 years of experience in Corporate Finance, Financial Advisory and Investment Banking, with particular expertise in Structured Project Finance, Debt Advisory, Contract Negotiation and Project Development & Implementation. Prior to joining Master Group, he was a Partner at Bridge Factor (boutique financial advisory firm) where he oversaw the firm's power sector clients. In this role, his responsibilities included arrangement of financing and overall project development & implementation (tariffing, concession agreements, EPC and O&M contracts finalisation, etc). He has been involved in the wind industry of Pakistan since it's inception, and contributed to the successful financial close and implementation of numerous wind power projects, including FFC Energy Ltd., Foundation Wind Energy, Sapphire Wind Power Company Ltd., Gul Ahmed Wind Power Ltd. and Master Wind Energy Ltd. Before Bridge Factor, Mr. Dar worked as Director Finance at Cleantech, a local import and distribution company.

Professional Experience

o Jul 2015 – Present	Chief Operating Officer, Master Group Energy Division
o Dec 2008 – Jun 2015	Partner, Bridge Factor
o Mar 2003 – Nov 2008	Director Finance & Accounts, Cleantech (Pvt.) Ltd.
o Oct 2006 – Oct 2009	Director Concept (Pvt.) Ltd.

Education

o Dec 2007 & Aug 2008	Cleared Level I & II, Chartered Financial Analyst Program (CFA Institute, USA)
o Jan 2007	MBA Finance, Bahria University, Pakistan

❖ SYED SHAHZAD ALI – GENERAL MANAGER PLANT OPERATIONS

Syed Shahzad Ali has over 16 years of experience in the field of Electrical Engineering. He has been a part of several reputable organisations, with varied responsibilities including project management, engineering, technical support and maintenance. Prior to joining Master Group of Industries, Mr. Ali worked as Project Manager and Electrical Engineer at Al Ajjaj Ltd. Co., a leading electro-mechanical engineering company based in Qatar, where he successfully managed the electrical engineering of the firms numerous development projects, including power generation and transmission. He was responsible for supervising the on-site electrical works of the Master Wind Energy Limited and Master Green Energy Limited and worked closely with the EPC contractor's electrical team to ensure smooth development activities and commissioning of the Projects. Currently, he is the General Manager Plant Operations for the 52.80 MW Master Wind Energy Limited and 50 MW Master Green Energy Limited wind power plants and ensures smooth operations. He is also overseeing power projects of MGI which are in developmental phase.

Professional Experience

o Nov 2014 – Present	Senior Project Manager, Master Group Energy Division
o Aug 2010 – May 2014	Project Manager/Senior Electrical Engineer, Al Ajjaj Ltd. Co. (Qatar)
o Aug 2008 – Jul 2010	Senior Engineer, Areva T&D (Pvt.) Ltd. Formerly ALSTOM (Pakistan)
o Nov 2007 – Jul 2008	Electrical Engineer, Al Ajjaj Ltd. Co. (Qatar)
o Oct 2006 – Oct 2007	Assistant Manager Electrical

Education

o 2005	Bachelor Tech. (Electrical) (Mehran University of Engineering and Technology)
o 1999	D.A.E. (R, TV and Electronics) (Sindh Board of Technical Education, Karachi)

❖ GOHAR QUDOOS – ELECTRICAL ENGINEER

Gohar Qudoos is a seasoned electrical engineering professional with over 20 years of rich experience in electrical substations, project management, and protection systems. With an impressive track record at leading organizations like Siemens, AALCO, and SCAN Electromechanical, he has demonstrated expertise in testing, commissioning, and operational management of high-voltage substations across the UAE, Qatar, and Pakistan. A certified expert in substation protection calculations and IEC61850 configuration, Gohar has contributed to complex projects, including 66kV GIS systems and 11kV networks, ensuring seamless execution and reliable outcomes. Currently, he is working with Master Group of Industries as an Electrical Engineer and has a sound knowledge of his field work.

Professional Experience

o Nov 2024 – Present	Electrical Engineer, Master Group Energy Division
o June 2014 – Oct 2024	Protection Engineer, SCAN Electromechanical LLC, Sharjah (UAE)
o Oct 2008 – Jun 2014	Protection / Testing Manager, AALCO (Qatar)
o Oct 2007 – Sep 2008	Specialist Power. Mobilink (Pakistan)
o June 2007 – Sep 2007	Electrical Engineer, Imperial Electric Company (Pakistan)
o Apr 2004 – May 2007	Executive Engineer, Siemens Pakistan Engineering Co. Ltd. (Pakistan)

Education

o 2004	Bachelor of Engineering (Electrical) (UET Lahore, Pakistan)

❖ RASHID HUSSAIN BHATTI – ELECTRICAL ENGINEER

Rashid Hussain Bhatti is a highly skilled electrical engineer with 19 years of experience in the installation, commissioning, and operations of power plants, switchyards, and substations. Having held key roles in prominent projects such as Sachal Wind Energy (49.5 MW), Shat-al Basra Power Plant (1250 MW, Iraq), and Uch-II Power Plant (404 MW), he has demonstrated expertise in managing high-voltage systems, SCADA, and GIS/AIS substations. Proficient in electrical protection systems, DC setups, and emergency operations, Rashid has been instrumental in delivering reliable and efficient solutions across Pakistan and the Middle East.

Professional Experience

o Dec 2024 – Present	Electrical Engineer, Master Group Energy Division
o Aug 2016 – Nov 2021	Sachal Wind Energy Limited (Pakistan)
o Aug 2014 – Aug 2016	Halcrow Pakistan (Pvt) Limited (Pakistan)
o Feb 2014 – Aug 2014	Voyage Global Energy (Iraq)
o Oct 2012 – Feb 2014	OMS (Pvt) Limited (Pakistan)
o Aug 2007 – Oct 2012	Mott Mac Pakistan (Pvt) Limited (Pakistan)
o Sept 2004 – Aug 2007	Al – Abbas Industries (Pvt) Limited (Pakistan)
o Mar 2003 – Sept 2004	Flowtronix (Pvt) Limited (Pakistan)

Education

o 2003	Bachelors of Engineering (Electrical) (Mehran University, Pakistan)

ANNEXURE – H
PROJECT TECHNICAL PROPOSAL

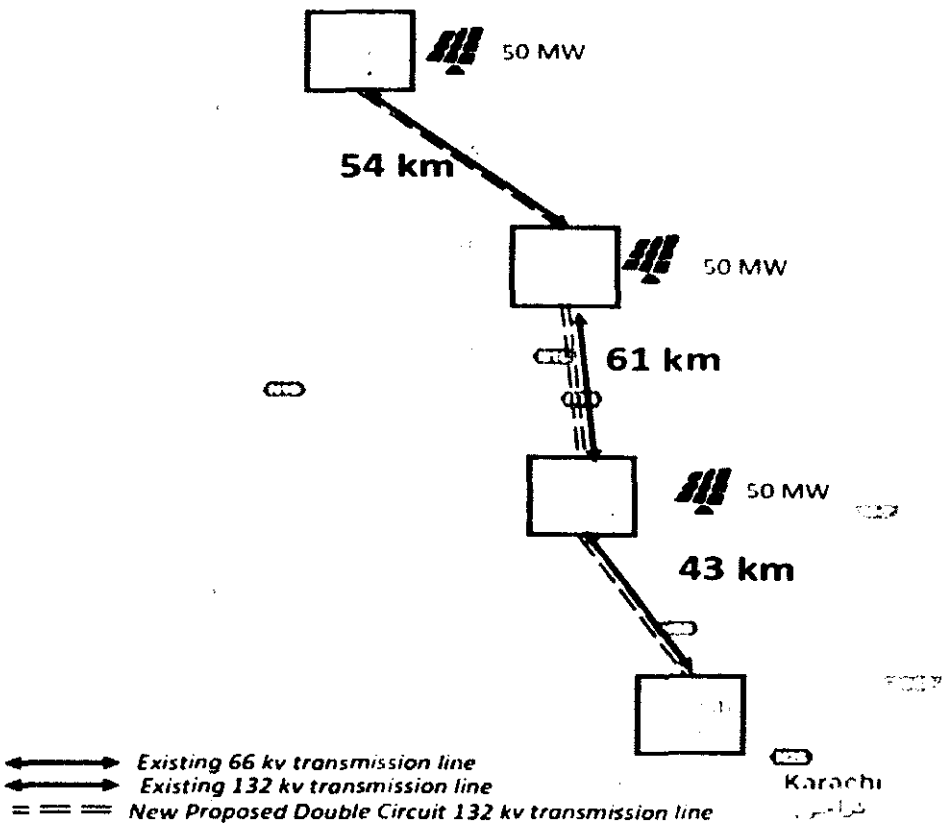
RAD

Table of Contents

RNP

1. Interconnection Study

The nearest substations of K-Electric, based on the location of these solar plants are Winder, Uthal and Bela grid station. The existing 66 kV transmission line will be dismantled while a new double circuit 132 KV transmission line along with Winder, Uthal and Bela grid stations will be re-constructed using AAAC Greeley conductor. The proposed routes of the 132 kV double circuit transmission lines will be crossing over the Winder and Bela sites. The length of single circuit transmission line from Hub Chowki to Bela 132 kV grid station after the interconnection of all three power plants will be about 158 km. Proposed interconnection scheme is mentioned as below:



2. Project Site Location (Location Map, Site Map, Land)

Site Location of the Solar Power Plant of Master Solar Energy Limited

The Project is situated in Lasbela District, Balochistan Province, and is located approximately 177 kms from Karachi, Pakistan's commercial hub and main coastal/port city. The National Highway-25 is the connecting road to the Project Site.

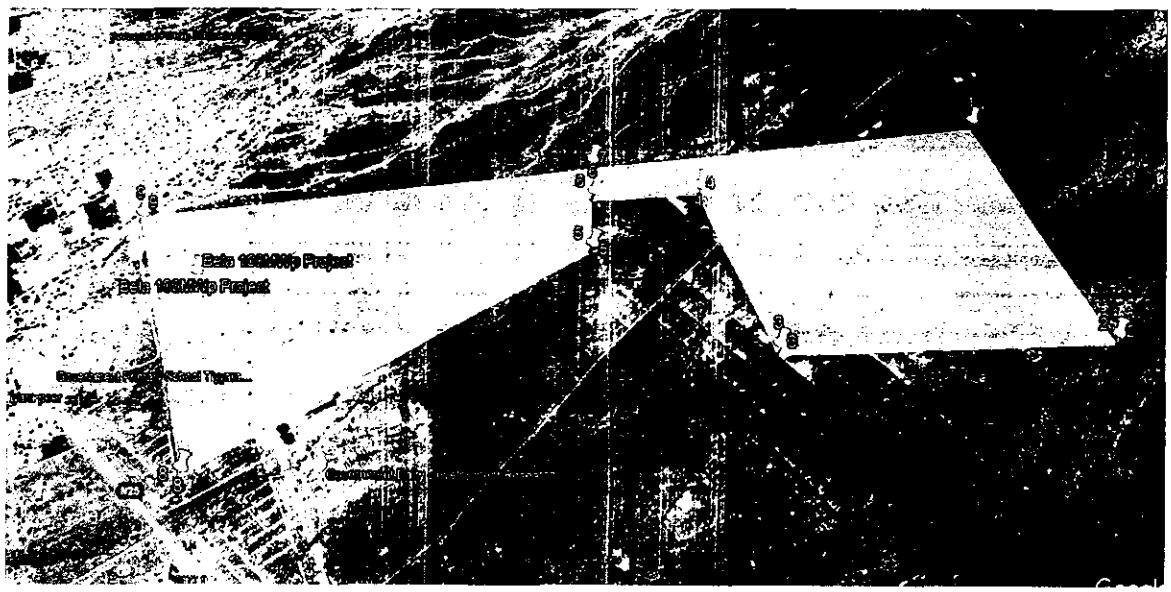
Based on a World Bank study, the resource potential of Balochistan is the highest in the Country. Around 40% of the land area of Balochistan receives direct solar insolation with an energy potential of more than 6 kWh per square meter per day. Vast majority of land in the area is barren, making it an ideal site for putting up solar panels.[1] This solar potential in the province of Balochistan is to date untapped, with no solar projects located in the region as of today. The Project is hence strategically positioned to capitalize on the city's expanding infrastructure and connectivity. With the completion of major projects like integration into the China-Pakistan Economic Corridor (CPEC), Balochistan is poised for exponential growth and increased demand for electricity.

The geographical location of the Project is shown in the figure below.

[1] chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://documents1.worldbank.org/curated/zh/352401468145176136/pdf/ACS22580WP0v500art020Energy0Sector.pdf

Layout of Generation Facility/ Solar Power Plant of Master Solar Energy Limited

The general layout of the Solar Farm of Master Solar Energy Limited at Bela is shown in the figure below.



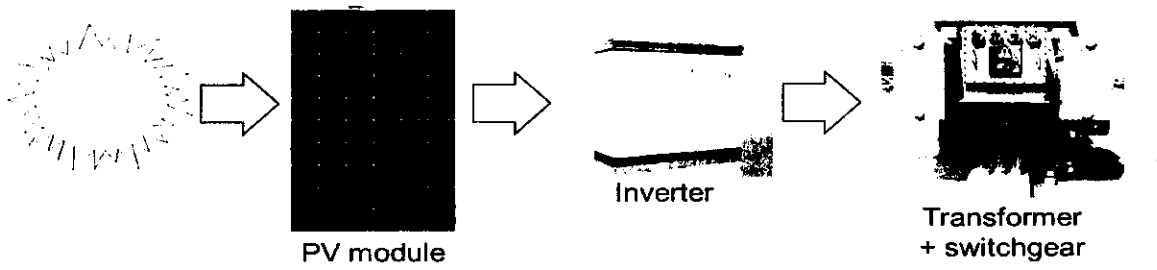
Land Coordinates and Micro-sitting of the Generation Facility/Solar Power Plant of Master Solar Energy Limited

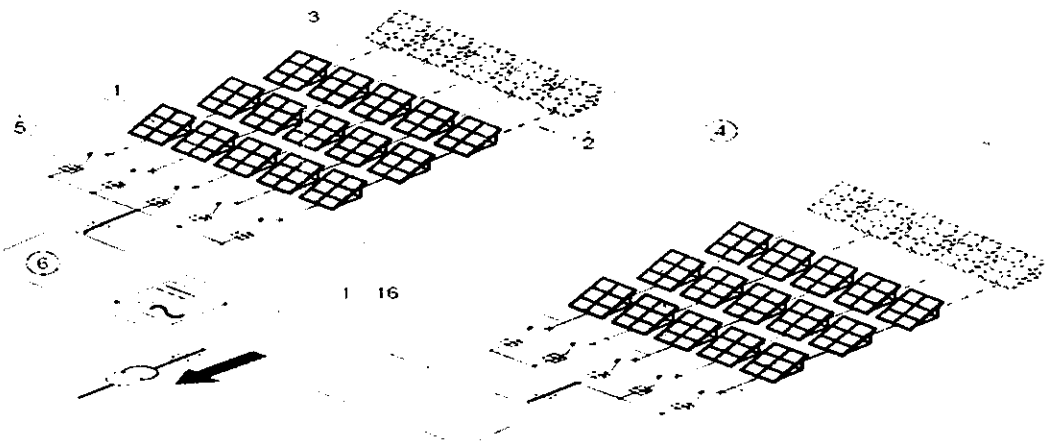
100 MW Bela:

Boundary	Latitude	Longitude
A1	26.137725°	66.436981°
A2	26.129906°	66.439278°
A3	26.129628°	66.429342°
A4	26.135217°	66.427439°
A5	26.133083°	66.423889°
A6	26.134987°	66.423936°
A7	26.136222°	66.423889°
A8	26.126194°	66.412722°
A9	26.134333°	66.409306°

3. Technology, size of plant, number of units

Process flow diagram of Solar PV Project of 100MWp Bela are as below:





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

RND

Technical details of the equipment are as below:

Project Bela:

(a)	Solar Panels – PV Modules	
(i).	Type of Module	Trina Vertex N 715/720 Wp OR Longi Hi-MO 9 655/660 Wp OR Longi Hi-MO 7 620 Wp
(ii).	Type of Cell	N-type i-TOPCon Bifacial Dual Glass (Trina) OR LR8-66HYD Monocrystalline Bifacial (Hi-MO 9) OR LR7-72HGD Monocrystalline Bifacial (Hi-MO 7)
(iii).	Dimension of each Module	2384×1303×33 mm (Trina) OR 2382×1133×30 mm (Hi-MO 9) OR 2278×1134×30mm (Hi-MO 7)
(iv).	Number of Panels	140,868 (Trina) OR 152,675 (Hi-MO 9) OR 161,300 (Hi-MO 7)
(v).	Module Area	3.094 m^2 (Trina) OR 2.699 m^2 (Hi-MO 9) OR 2.689 m^2 (Hi-MO 7)

(vi).	Panel's Frame	Anodized Aluminium alloy
(vii).	Weight of one Module	38.3 Kg (Trina) OR 33.5 Kg (Hi-MO 9 and Hi-MO 7)
(viii).	No of Solar Cells in each module	132 Cells (Trina) OR 144 Cells (Hi-MO 9 and Hi-MO 7)
(ix).	Efficiency of module	23 %
(x).	Maximum Power (P_{max})	710Wp (Trina) OR 655Wp (Hi-MO 9) OR 620Wp (Hi-MO 7)
(xi).	Voltage @ P_{max}	41.3V (Trina) OR 41V (Hi-MO 9) OR 44.33 V (Hi-MO 7)
(xii).	Current @ P_{max}	17.44 A (Trina) OR 16.1 A (Hi-MO 9) OR 13.99 A (Hi-MO 7)
(xiii).	Open circuit voltage (V_{oc})	49.4 V (Trina) OR 49.71 V (Hi-MO 9) OR

RAD

		52.77 V (Hi-MO 7)
(xiv).	Short circuit current (I_{sc})	18.59 (Trina) OR 16.80 A (Hi-MO 9) OR 14.85 A (Hi-MO 7)
(xv).	Maximum system open Circuit Voltage	1,500
(b)	**PV Array**	
(i).	Nos. of Strings	5031 (Trina) OR 6107 (Hi-MO 9) OR 6452 (Hi-MO 7)
(ii).	Modules in a string	28 (Trina) OR 25 (Hi-MO 9) OR 26 (Hi-MO 7)
(c)	**Inverters**	
(i).	Capacity of each unit	8.8 MW (Sungrow) OR 330 Kw (Huawei)
(ii).	Manufacturer	Sungrow OR Huawei
(iii).	Input Operating Voltage Range	895 – 1500 V (Sungrow) OR 500 – 1500 V (Huawei)

(iv).	Number of Inverters	10 (Sungrow) OR 280 (Huawei)	
(v).	Efficiency of inverter	98.77% (Sungrow) OR 98.8% (Huawei)	
(vi).	Max. Allowable Input voltage	1500 V	
(vii).	Max. Current	8 x 1435 A (Sungrow) OR 6 x 65 A (Huawei)	
(viii).	Max. Power Point Tracking Range	895 – 1500 V (Sungrow) OR 500 – 1500 V (Huawei)	
(ix).	Output electrical system	3 Phase AC	
(x).	Rated Output Voltage	20 kV – 35 kV (Sungrow) OR 800V, 3W + PE (Huawei)	
(xi).	Power Factor (adjustable)	0.8 leading —0.8 lagging	
(xii).	Power control	MPP Tracker	
(xiii).	Rated Frequency	50 Hz	
(xiv).	Environmental Enclosures	Relative Humidity	0~95%, non-condensing
		Audible Noise	-
		Operating Elevation	1000 m
(xv).		Operating temperature	-20°C~+60°C

(xvi).	Grid Operating protection	A	DC circuit breaker
		B	AC circuit breaker
		C	DC overload protection (Type 2)
		D	Overheat protection
		E	Grid monitoring
		F	Insulation monitoring
		G	Ground fault monitoring
(d)	**Data Collecting System**		
(i).	System Data	Hardwired Connection via RS485, Ethernet and/or FO	
(e)	**Power Transformer**		
(i).	Rating	2 x 100 MVA or 3 x 50 MVA	
(ii).	Type of transformer	ONAN/ONAF	
(iii).	Purpose of transformer	Step-up (33 kV/132 kV)	
(iv).	Output Voltage	132 KV	
(f)	**Mounting Structure**		
(v).	Structure	Single Axis Tracker System	
(vi).	Tilt of Array Frame	± 60 °	
(vii).	Array Specifications	Portrait Oriented, 1Px 87 Modules or 1P x 84 Modules in a structure (tracker table)	
(g)	**Unit Transformer**		
(i)	Rating	8800 kVA @50 Degree Celsius	
(ii)	Type of transformer	33kV Oil Type Transformer	
(iii)	Purpose of transformer	Step-up (0.63 kV / 0.63 kV / (20 – 35) kV	

(iv)	Output Voltage	33kV

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

Preliminary Single Line Diagram of Bela 100MWp solar power Project has been attached as Appendix A to this Annexure H.

4. Water source at site for maintenance

Water will be required for dust prevention during the construction phase and for cleaning of modules in the operation phase.

Water Demand

Majority of the water will be needed for regular cleaning of the modules. Furthermore, small amounts of water will be needed for domestic consumption (e.g. living), landscaping and dust prevention on roads / tracks. Wet cleaning of the modules is supposed to take place monthly. The total demand of fresh water is estimated to be approx. 45,325 m^3 / year including the amount for domestic, landscaping and dust prevention consumption for the power plant. The daily water demand equals to approx. 12.5 m^3 / day per 50 MWp Solar power plant.

However, after extensive analysis of the site conditions, it is suggested that the modules be cleaned via dry brushing at least once per week to ensure maximum output. In the case of weekly wet cleaning, the water demand can rise further.

Water Supply

Inquiries from the locals living in surroundings of Bela's site and the feasibility study of the Project indicate that reasonable quality of ground water is present at about 60m to 70m depth below the existing ground level. A solar tube well has been installed in a nearby village which is about 0.5km to 1km from the Project site. For a sustainable source of water, it is better to install a tube well with RO plant within the Project site boundary after performing detailed ground water survey.

Water Reuse / Treatment / Disposal

The water utilized for cleaning the modules will not be reused or treated after the module cleaning procedure. The water will be let to seep away into the ground, as catching the water before dropping off the modules is a very complex process. As environmental pollutants, e.g. dust, sand, and bird droppings, are mixed within the used cleaning water, those naturally occurring elements are not regarded to give any negative influence to the PV plant's soil. However, in the long term of solar plant operations, it can be efficient to apply some type of water recycling system to reduce freshwater consumption for module

RAD

cleaning process. Nonetheless, the module manufacturer's specifications regarding water quality will be considered.

Water used for domestic supply is supposed to be collected in underground wastewater storage tanks. A procedure to recycle grey water, e.g. from lavatory, is not scheduled currently, but recommended to be applied for efficient reduction of freshwater consumption.

Water Management Plan

A water management plan for construction and operation of the solar power plant as follows shall be carried out:

- Water demand of the plant (e.g. for construction and cleaning of the modules).
- Water supply to the plant (based on the hydrological situation in the area).
- Water reuse / recycling schemes (e.g. waste treatment, storage ponds).
- Wastewater discharge (e.g. quality and amount of wastewater, run-off systems, etc.).
- Water-related (hydrological) environmental impact analysis.

5. Infrastructure: road, rail, staff colony, amenities

Please refer to Annexure I - Project Feasibility Study, of the Generation License Application.

6. Safety and emergency plans

The Applicant will ensure compliance of all the requirements mentioned in the K-Electric RFP document regarding safety and security, as well as the guidelines on safety signs and barricade guidelines provided by KE as part of the RFP package, attached as Appendix B to this Annexure H.

For the feasibility study of the Project, please refer to Annexure I - Project Feasibility Study, of the Generation License Application.

7. Plant characteristics (generation voltage, power factor etc.)

The characteristics of the Solar Plant are as follows:

Generation Voltage	132 kV
Projected Energy Output	213,455 MWh / Year
Power Factor	As per NEPRA Grid Code
Frequency	50 Hz
Automatic Generation Control	SCADA controlled
Ramping Rate	Not Applicable

8. Control, metering and instrumentation

The Applicant will ensure compliance with all the requirements mentioned in the K-Electric RFP document regarding SCADA, Tele-Communication and Protection Schemes, Metering System and Back-up Metering System, Weather Station and Plant Monitoring System.

9. Generation Capacity and Performance Metrics

(1).	Total PV Installed Capacity of the Generation Facility/Solar Farm	100 MWp
(2).	Average Sun Hour Availability/Day (Irradiation on Inclined Surface)	8 to 8.5 Hrs
(4).	PV Plant Generating Capacity Annually (As Per Simulation)	213,455 MWh
(5).	Expected Total Generation in 25 years Life Span	5,077,642 MWh
(6).	Net Capacity Factor	24.37%

10. Degradation factor

Period	Degradation Factor
Year 1	1%
Year 2 onwards	0.40%

Appendix A – Single Line Diagram (Electrical)

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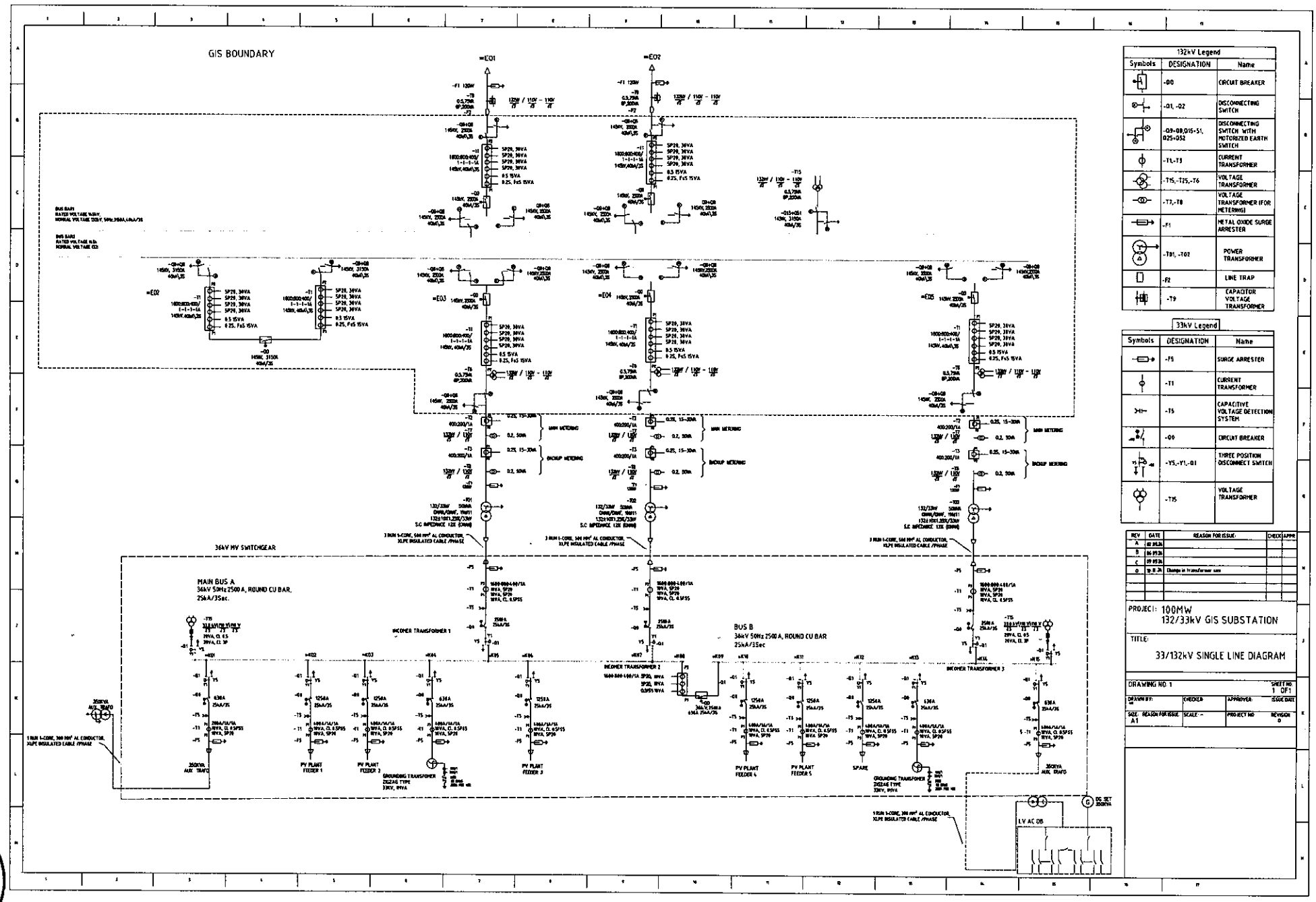


132kV Legend		
Symbols	DESIGNATION	Name
	-QQ	CIRCUIT BREAKER
	-Q1, -Q2	DISCONNECTING SWITCH
	-Q9-Q8,Q15+51, Q25+Q52	DISCONNECTING SWITCH WITH MOTORIZED EARTH SWITCH
	-TA,-TB	CURRENT TRANSFORMER
	-TP5,-T25,-T6	VOLTAGE TRANSFORMER
	-T7,-T8	VOLTAGE TRANSFORMER (FOR METERING)
	-F1	METAL OXIDE SURGE ARRESTER
	-TB1, -T02	POWER TRANSFORMER
	-F2	LINE TRAP
	-T9	CAPACITOR VOLTAGE TRANSFORMER

33kV Legend		
Symbols	DESIGNATION	Name
	-F5	SURGE ARRESTER
	-T1	CURRENT TRANSFORMER
	-T5	CAPACITIVE VOLTAGE DETECTION SYSTEM
	-QQ	CIRCUIT BREAKER
	-Y5,-Y1,-Q1	THREE POSITION DISCONNECT SWITCH
	-T15	VOLTAGE TRANSFORMER

REV.	DATE	REASON FOR ISSUE:	CHECK	APPR
A	07.05.24			
B	06.05.24			
C	09.05.24			
D	10.11.24	Change in transformer size		

PROJECT: 100MW
132/33kV GIS SUBSTATION

TITLE:
33/132kV SINGLE LINE DIAGRAM

DRAWING NO: 1 — SHEET NO: 1 OF 1

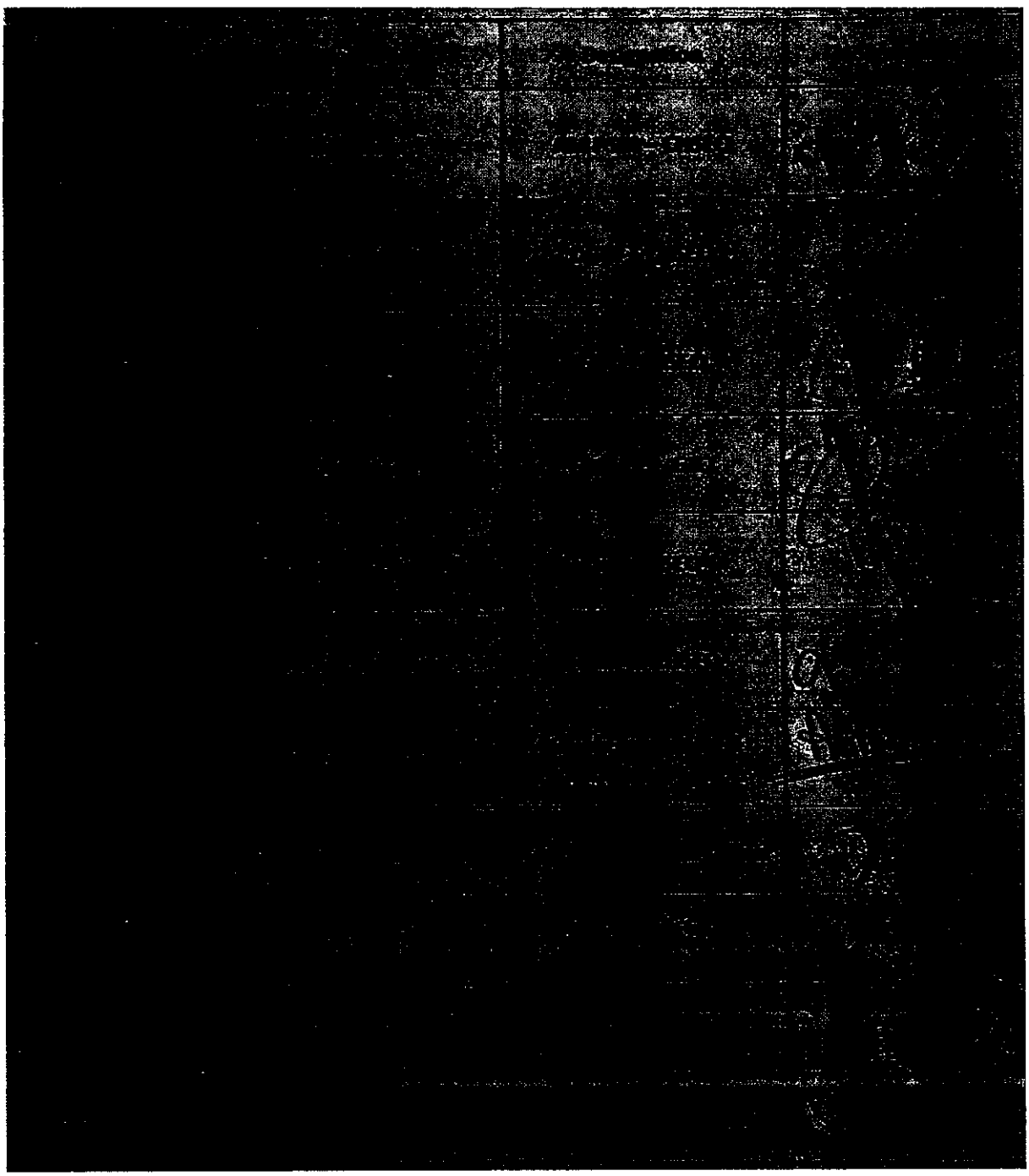
DRAWN BY: — CHECKED: — APPROVED: — ISSUE DATE:

SIZE: A1 — REASON FOR ISSUE: — SCALE: - — PROJECT NO: — REVISION: 0

Appendix B – Safety & Barricade Guidelines

SAFETY SIGNS & BARRICADE GUIDELINES

APPROVALS



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DOCUMENT CHANGE RECORD

REV. NO	DESCRIPTION OF CHANGE	EFFECTIVE DATE
00	Initial Version	Oct 2023

Contents

RAD

1.0 PURPOSE

This procedure provides guidelines to protect personnel by preventing or controlling access to hazard/ high risk work areas by the installation and maintenances of barricades and safety signs. It defines the requirements for and appropriate methods and types of barricades and safety signs to be opt and utilized at K-Electric. This procedure details the application of:

- The requirement of hard/ soft barricades
- Types of Barricade Tape
- Types of Safety Signs
- Appropriate signs to be used to highlight the magnitude of hazard

2.0 SCOPE

This procedure shall be applicable to all KE, OSP, Contractors/ PQC employees across all Business Unit.

3.0 BARRICADES

Barricades can be classified as either soft barricade or hard (solid) barricade.

3.1 Soft Barricade

Soft barricades are those that use an appropriate tape to prevent or restrict access to an area. There are four types of soft barricades at K-Electric. They are to be used to identify and protect personnel from general hazards and also those which are high risk and may pose a risk to life and health.

3.1.1 Caution Barricade Tape

The caution tape shall be used to highlight minor hazards to other personnel that may need to access the area. Any person may access into a caution barricaded area as long as they have familiarized themselves with the hazards detailed on the barricade signage and implemented any controls indicated on the signage/ tags.

Figure 1 Caution Tape

3.1.2 Restricted Access Barricade Tape

This restricted access tape restricts access to the barricaded work area by any individual except area owner. This tape shall be used for high potential danger such as naked LT, HT or EHT wires/ lines uncovered hot surfaces, falling objects and unprotected edges.

Access inside restricted access barricaded area can only be made after seeking permission (at least verbal is must) from Respective Location or Area Owner/ Site Supervisor/ Shift In-charge/ Area Operator.

Location/Area owner or Site Supervisor must ensure all non-authorized individuals are kept outside this barricade while maintenance supervisors must ensure their manpower respects this barricade and does

RAD

not tress pass it without seeking permission.

Figure 2 Restricted Access Barricade Tape

3.1.3 High Voltage Testing Barricade Tape

- A high voltage testing barricade shall be erected around electrical equipment that is under test to provide a minimum safe approach distance for untrained persons.
- Where testing is performed inside metal clad switchgear or similar enclosed spaces, barricading is not required, provided the testing area is not left unattended and a red flashing light is used when test voltages are applied.
- Flashing red lights shall be installed and activated when test voltages are applied

Figure 3 High Voltage Barricade Tape

3.1.4 Radiation Affected Zone Barricade Tape

This barricade tape must specifically be used to highlight radiation hazard to all individuals. Radiation affected zone barricade tape shall be placed by person who is supervising the activity from KE like Competent Person (in Generation Plants) or Shift In-Charge/ Area Owner (in other locations and facilities of KE). Barricade signage should specifically mention "Radiation Hazard" as a reason behind barricade.

NO INDIVIDUAL (including area owner) is allowed to tress pass this barricade without seeking permission from on duty person who is supervising the Radiography Activity from KE.

Competent Person (for Generation Plant) or Shift In-Charge/ Area Owner (in other locations and facilities of KE) shall inform Senior Authorized Person (SAP)/ Location Owner regarding the planned Radiography in specific area, date, and time period. SAP/ Location Owner shall issue an e-mail to all relevant regarding this planned activity.

All supervisors/ in charges are responsible for adequately informing their employees about the planned radiography.

Figure 3 Radiation Affected Zone Barricade Tape

3.1.5 Safety Cones

- Orange/ White colored Safety cones can be opted as barricade where work is being carried out in public areas (roads) with the help of vehicle like MTL (Mobile Transport Ladder).
- All the works where MTL is not used as the primary source for the activity, other barricade shall be used as defined in the procedure

3.2 Hard (Solid) Barricade

A hard barricade is a physical structure such as scaffold pipes that prevent or restrict access to an area. If scaffold pipes are being used as barricade, then it should have top, mid and toe rail installed as per standard height used for scaffolds.

The purpose of a solid barricade is to provide a physical barrier capable of performing the same function as a permanent guardrail

Where solid barricades are used, they shall be accompanied with signs to communicate the hazard information. In addition, appropriate barricade tape may be used to highlight the existence of the barricaded area.

Hard (solid) Barricade installation shall be made mandatory for those areas where hazards are present for long tenure and cannot be rectified for days, weeks or month such as, trenches, excavations (highways, roads, streets), uncovered drain channels etc. Approach Roads, road crossing etc.

4.0 ERECTION AND USE OF BARRICADE

The barricade shall encompass the entire potentially affected area of the hazard and consider factors such as:

- possible deflection of an object if it falls
- slag or sparks created from hot work activities
- distance from the hazard
- creating an additional hazard, for example, access and egress. Sites shall make sure that barricades are erected so that all sides of the hazard are protected from unauthorized access

All barricades shall be accompanied by an appropriate sign, which is to be placed on all access points. For details, refer to **Section 6.0 – Barricade Tag/ Signage**

Signs or tags shall clearly display the following information:

- the name of the person in charge of the barricaded area
- the hazards that are within the barricaded area
- the date and time
- the contact details of the person in charge of the area

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It shall be ensured that where soft barricading is used to provide a means of restricted access around a penetration or an unprotected edge, it is to be located at least two (2) meters from the outside of the edge.

Note: Where work is being carried out in public areas, roads etc., soft barricade shall be located at a minimum of 01 meter from the outside edge.

5.0 METHOD OF BARRICADING

5.1 Caution Barricade

Caution barricade tape shall be erected to inform personnel of an uncontrolled hazard within the barricaded area. The caution barricade tape is not suitable for medium, high, or extreme risk hazards. It is only suitable for minor hazards where the main control is for personnel to be aware of the hazard. .

Examples of suitable hazards that can be controlled by Caution barricades include:

- Trip hazards,
- Covered hot surfaces,
- Maintenance job on equipment
- Minor/ Drop wise leak
- Poor housekeeping zone

Caution barricades are not to prevent personnel from entering the barricaded area. They are to highlight the hazard so that personnel are well aware of the hazards while inside the barricade. This tape is not appropriate for height and unprotected edge hazards. The appropriate signage/ tag as mentioned in Section 6.0 of this procedure, shall always be attached to a caution barricade.

5.2 Restricted Access Barricade

Restricted access barricades shall be erected to prevent unauthorized personnel from accessing the barricaded area. The intent is that only the Area owner has access to the area while the hazard is present and uncontrolled.

This barricade is suitable to use to restrict access from hazards such as:

- Hot Work
- Persons working above / falling objects
- Medium/ Major Spills / leaks
- General delineation of a work area (e.g., cluttered access etc.)
- Unprotected edges creating a fall risk
- Electrical Hazard
- Excavation/ Trenches
- Around swing radius of equipment with a rotating superstructure
- Toxic Environment

Access inside restricted access barricaded can only be made after seeking permission from Respective Location or Area Owner/ Site Supervisor/ Shift In-charge/ Area Operator. The appropriate signage/ tag as mentioned in Section 6.0 of this procedure, shall always be attached to a caution barricade.

5.3 High Voltage Testing Barricade

Refer to Section 3.1.3.

5.4 Radiation Affected Zone Barricade

Refer to Section 3.1.4.

5.5 Hard (Solid) Barricade

Refer to Section 3.2.

Note: Where barricades are installed across roadways and will remain in place during hours of darkness, the barricade shall be fitted with flashing lights to identify the barricade / traffic obstruction.

6.0 BARRICADE TAG/ SIGNAGE

All barricades must be fitted with tags to explain the hazards inside the barricade.

6.1 Caution Barricade Tag

This tag has to be signed and placed on caution barricade by respective Area Operator (for Generation Plant) and Location Supervisor (for other KE Locations)

Shift In-charge (for Generation & Transmission) and Location Owner (for other KE Locations) should ensure all vicinity of hazard has been properly cordoned off.

6.2 Restricted Access Barricade Tag

This tag has to be signed and placed on restricted access barricade by respective Area Operator (for Generation Plant) and Location Supervisor (for other KE Locations)

Shift In-charge (for Generation & Transmission) and Location Owner (for other KE Locations) should ensure all vicinity of hazard has been properly cordoned off.

6.3 High Voltage Testing Barricade Tag

This tag has to be signed and placed on Danger (restricted access) barricade – Electrical Hazard by respective Area Operator (for Generation Plant) and Location Supervisor (for other KE Locations)

Shift In-charge (for Generation & Transmission) and Location Owner (for other KE Locations) should ensure all vicinity of hazard has been properly cordoned off.

6.4 Radiation Affected Zone Barricade Tag

Radiation affected zone will be calculated and highlighted by a person who is supervising the activity from KE such as Competent Person (in Generation Plants) or Shift In-Charge/ Area Owner (in other locations and facilities of KE). He shall get the barricade tape placed.

This tag has to be signed and placed by Area Operator (for Generation Plant) and Location Supervisor (for other KE Locations) on Radiation Affected Zone Barricade after signature by a person who is supervising the activity from KE such as Competent Person (in Generation Plants) or Shift In-Charge/ Area Owner (in other locations and facilities of KE)

Person who is supervising the activity from KE such as Competent Person (in Generation Plants) or Shift In-

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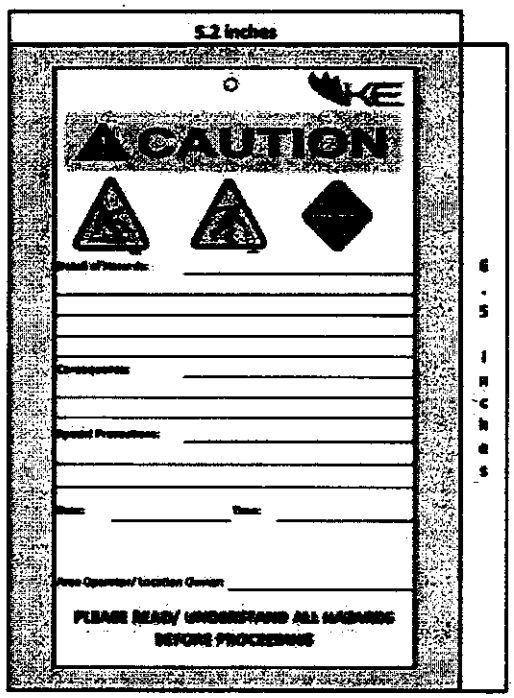
Charge/ Area Owner (in other locations and facilities of KE) should ensure all vicinity of hazard has been properly cordoned off.

Note: Tags should be placed on barricade tape, at various entry points adequately so that all access points get covered

7.0 BARRICADE TAG SIZE

All barricade tag shall be standardized across KE with below measurement.



8.0 WATCH LIGHTS/ NIGHT LIGHTS

Where barricades are installed across roadways and will remain in place during night hours of darkness, the barricades shall be fitted with flashing lights (preferably Battery Operated/ Photocell) to identify the barricade/ traffic obstruction. This shall be in addition to the barricading and display of safety signage at the working location / area under work.

9.0 SAFETY SIGNS

Safety Professionals believes that it is critical to effectively communicate the safety. Safety signs plays a vital role in achieving this objective. They are the visual tools use to:

- Remind people of potential hazards and how to avoid them
- Point people to the location of emergency equipment
- Direct people's path to safety in an emergency situation
- Reinforce safety training programs
- Inform people of security and limited access policies

9.1 Types of Safety Signs

9.1.1 Prohibition/ Danger Sign

A sign prohibiting behavior likely to increase or cause danger (e.g., no access for unauthorized persons'). Danger signs shall be used only where an immediate hazard exists.

Danger signs shall have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

Intrinsic features:

- Round shape
- Black pictogram on white background, red edging, and diagonal line (the red part to take up at least 35% of the area of the sign)

9.1.2 Caution Sign

A sign giving warning of a hazard or danger. Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices.

The standard color of the background shall be yellow, and the panel, black with yellow letters. Any letters used against the yellow background shall be black.

Intrinsic features:

- Triangular shape
- Black pictogram on a yellow background with black edging (the yellow part to take up at least 50% of the area of the sign)

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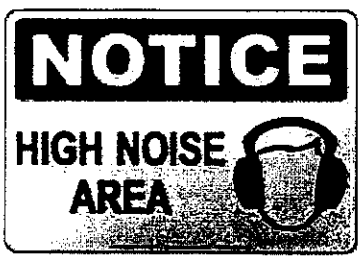
9.1.3 Notice and Mandatory Sign

A sign prescribing specific behavior (e.g., eye protection must be worn). Notice sign must be square in shape with a blue background and message written in white.

Mandatory Sign Intrinsic features:

- Round shape
- White pictogram on a blue background (the blue part to take up at least 50% of the area of the sign)



9.1.4 Safety Instruction Sign

Safety instruction signs, when used, shall be white with green upper panel with white letters to convey the principal message. Any additional wording on the sign shall be black letters on the white background (see accompanying figure).

9.1.5 Emergency Escape Sign

A sign giving information on emergency exits, first aid, or rescue facilities. i.e., emergency exit/ escape route.

Escape signs, when required, shall be lettered in legible red letters, not less than 6 inches high, on a white field and the principal stroke of the letters shall be at least three-fourths inch in width.

Intrinsic feature. rectangular or square shape.

9.1.6 Directional Sign

Directional signs, other than automotive traffic signs specified in the paragraph below, shall be white with a black panel and a white directional symbol. Any additional wording on the sign shall be black letters on the white background.

9.1.7 Fire Safety Signs

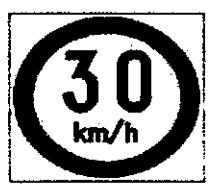
Provides information on the identification or location of firefighting equipment or gives warning in case of fire.

Intrinsic features:

- Rectangular or square shape.
- White pictogram on a red background (the red part to take up at least 50% of the area of the sign).

9.1.8 Traffic Directional Sign

Construction areas shall be posted with legible traffic signs at points of hazard. All traffic control signs, or devices used for protection of construction workers shall conform to American National Standards Institute ANSI D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.



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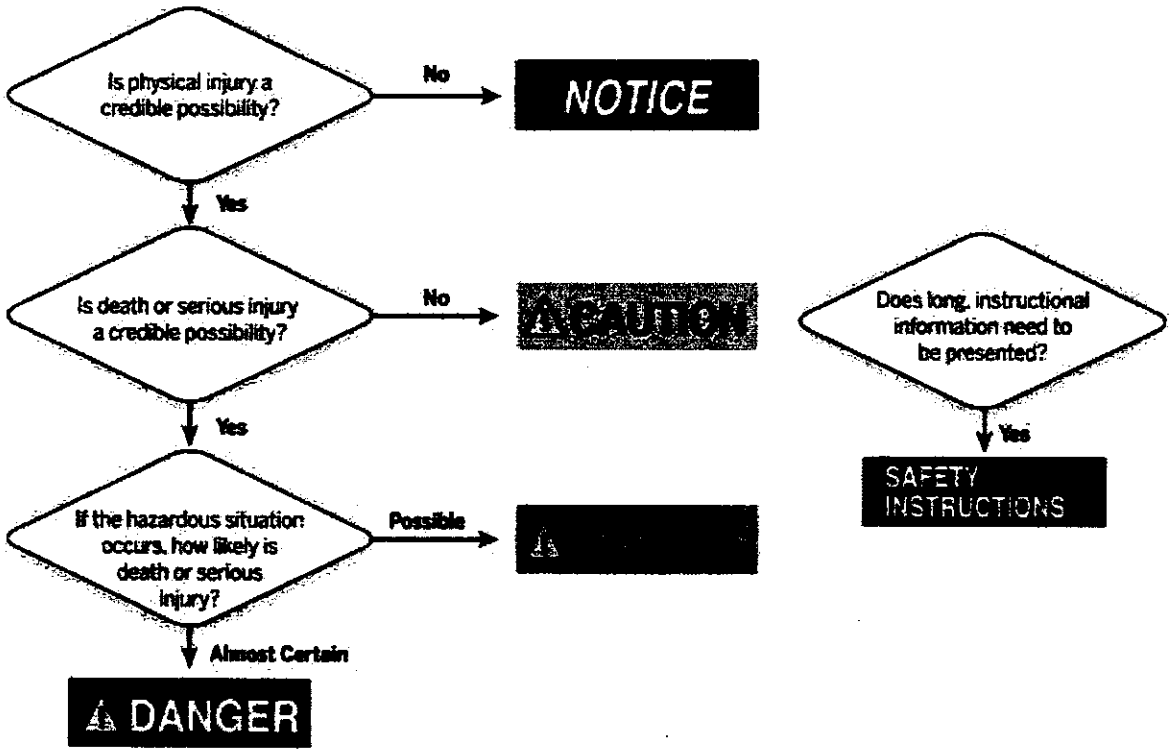
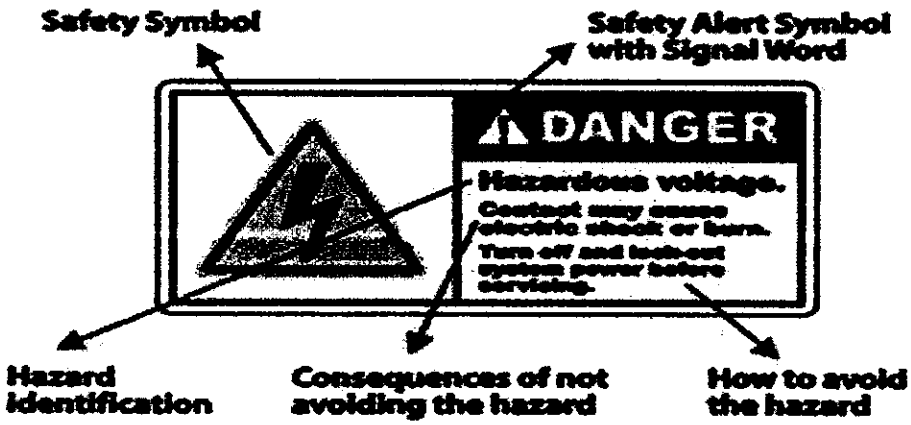
9.2 How to select a right sign to match risk level?

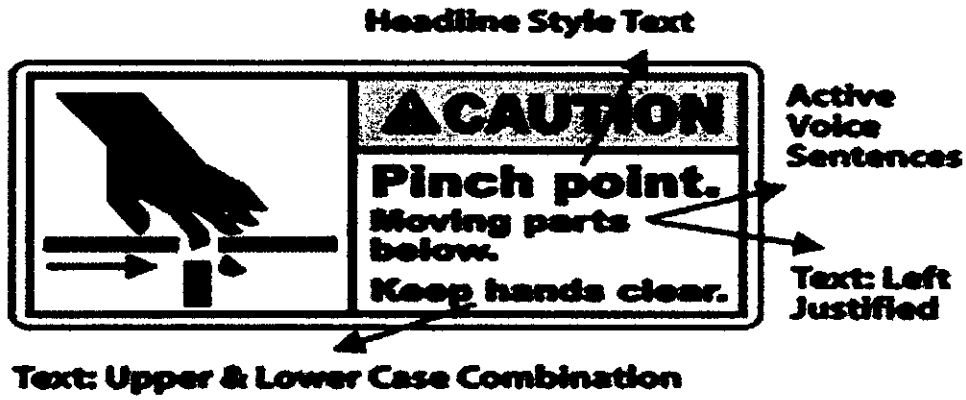


9.3 Safety Sign Format

The **safety alert symbol** shall precede the **signal word**. The base of the safety alert symbol shall be on the same horizontal line as the base of the letters of the signal word. The height of the safety alert symbol shall be equal to or exceed the signal word in letter height.

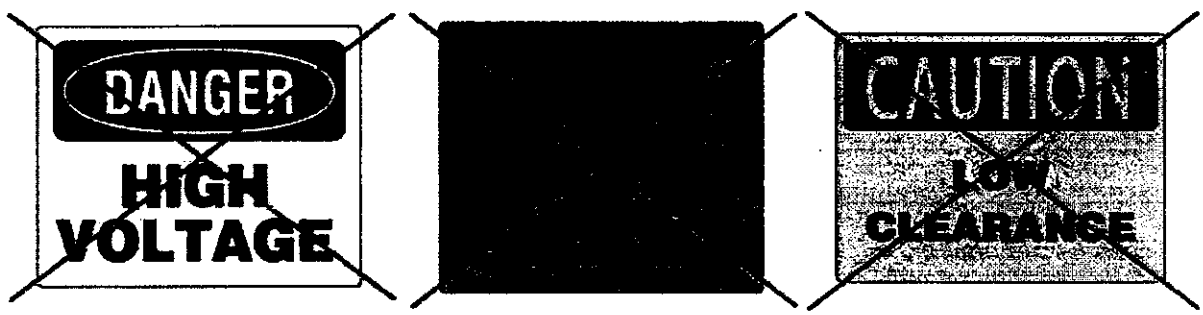
Following are the standard formats of safety signs.



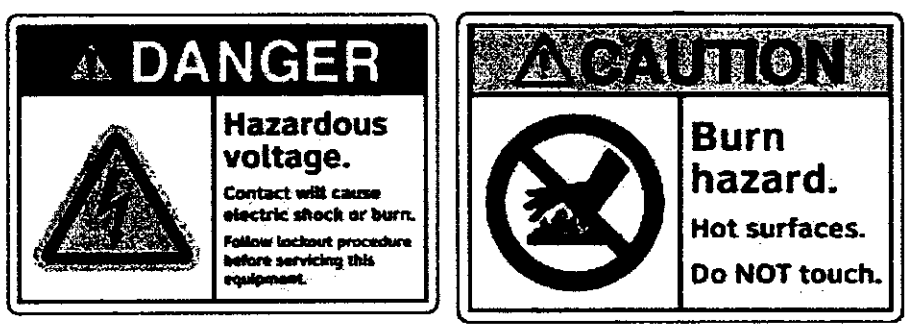


9.4 Old Vs New Safety Sign

9.4.1 Old OSHA/ ANSI Sign



9.4.2 New OSHA/ ANSI Sign



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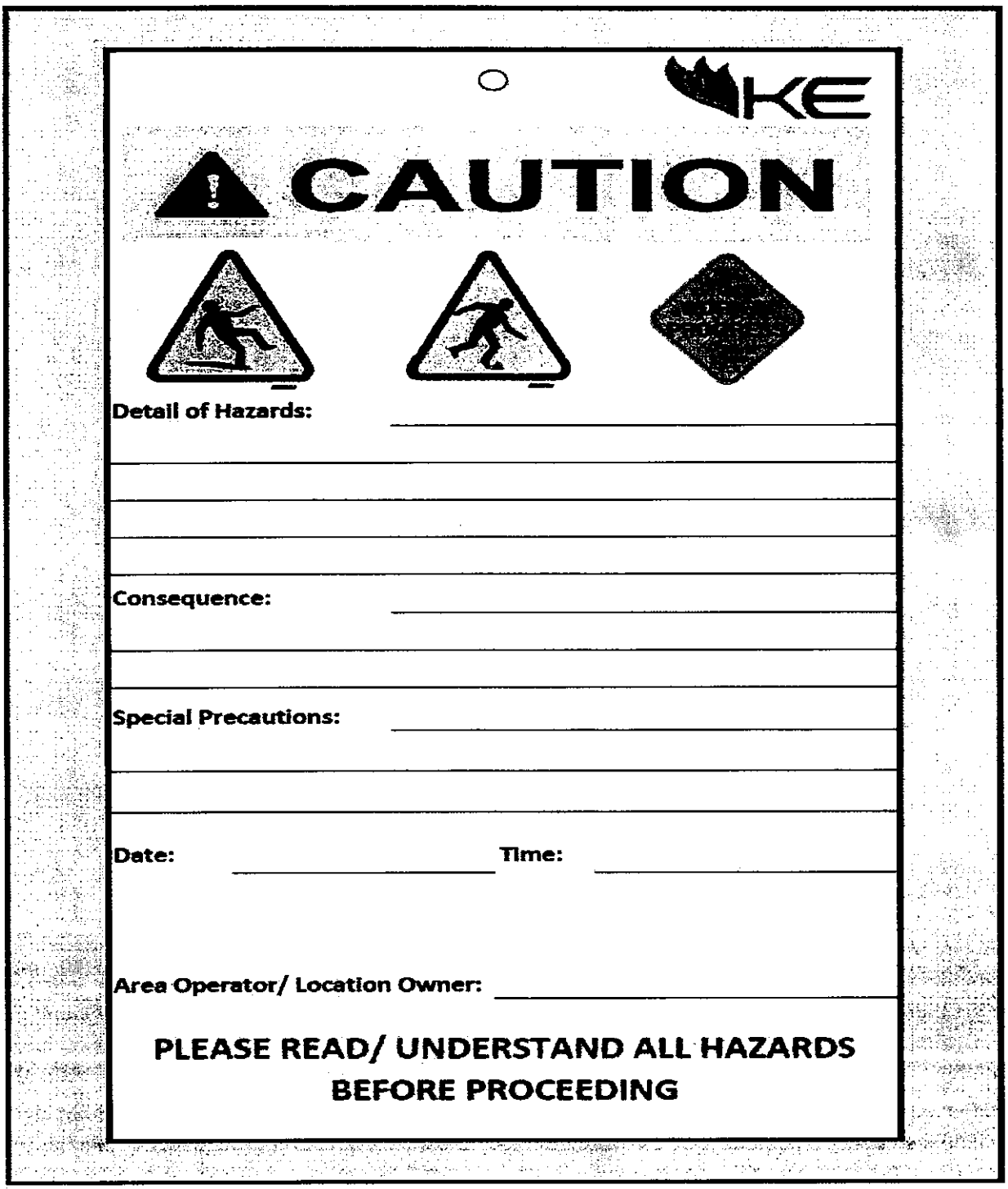
10.0 REFERNCES

- **OSHA 1910.144** - Safety color code for marking physical hazards.
- **OSHA 1910.145** – Specifications for accident prevention signs and tags.
- **ANSI Z535.5-2022** - Safety Tags and Barricade Tapes (For Temporary Hazards)

11.0 ATTACHMENTS

1. Caution Barricade Tag
2. Danger (Restricted Access) Barricade Tag
3. Radiation Effected Zone Barricade Tag
4. Danger Tag Electrical Hazard Barricade Tag

Caution Barricade Tag



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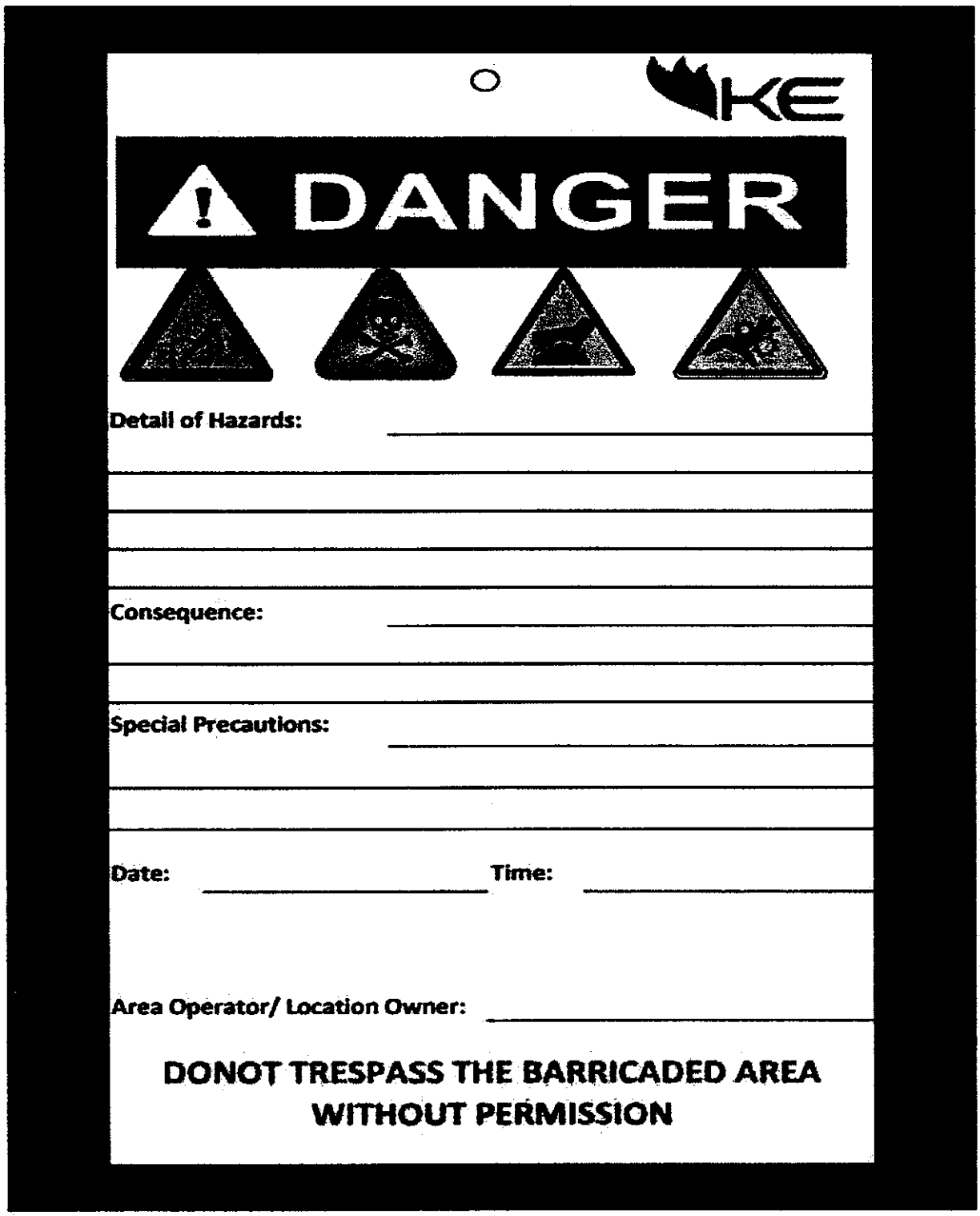
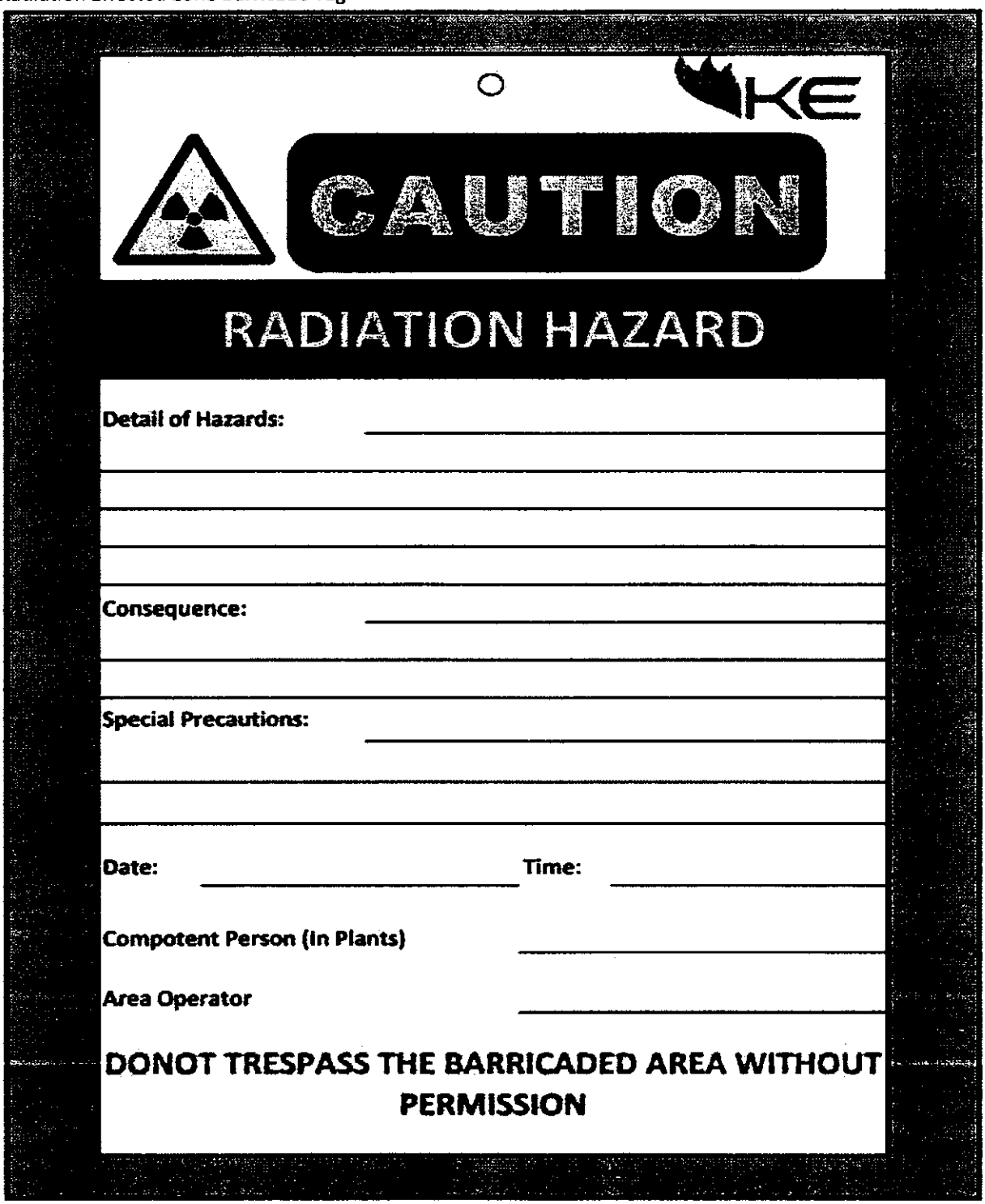
Danger (Restricted Access) Barricade Tag

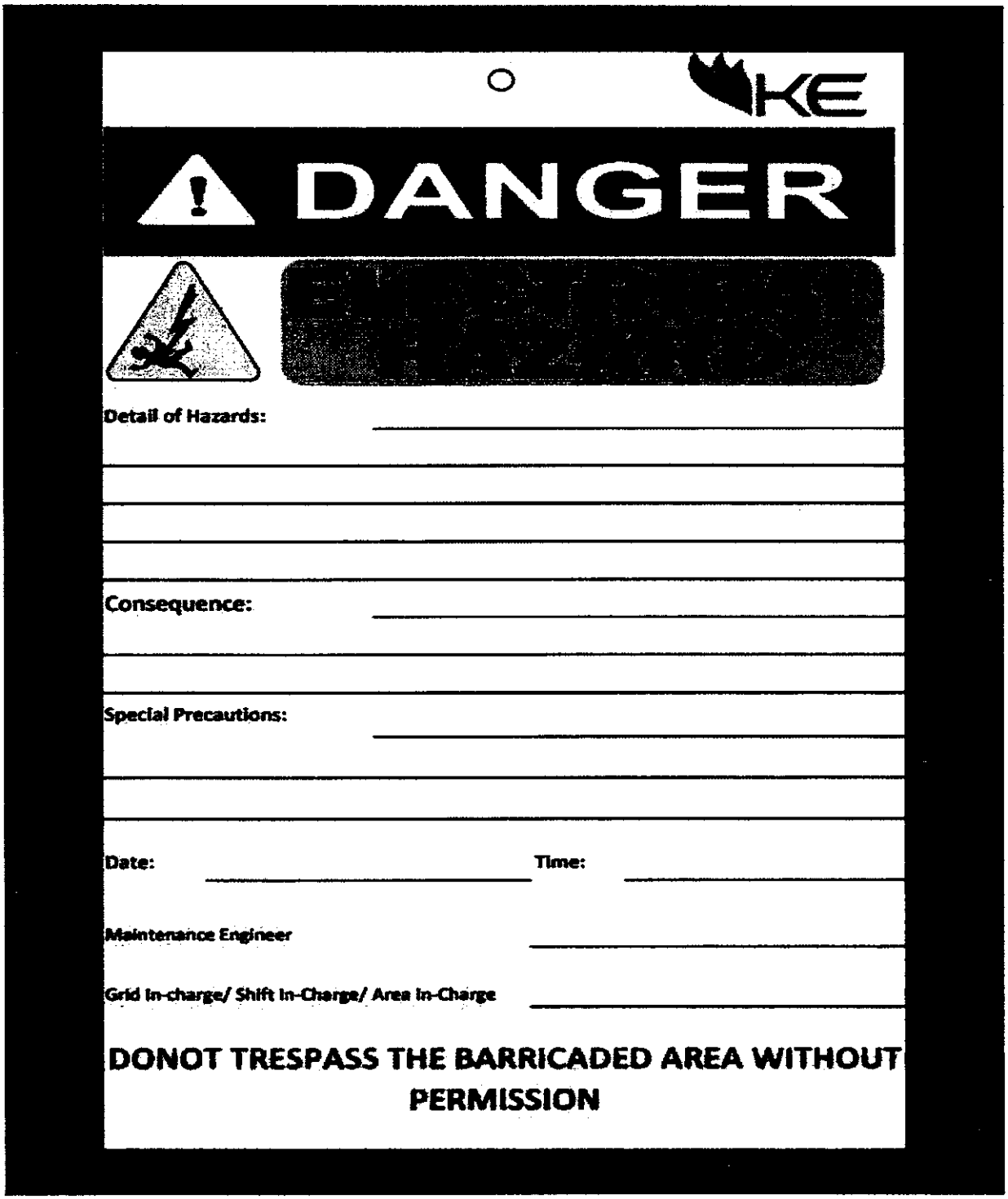


Radiation Effected Zone Barricade Tag



2AD

Danger Tag Electrical Hazard Barricade Tag



ANNEXURE – I
PROJECT FEASIBILITY STUDY

8.2 | The Experts in Renewable Energy

Feasibility Study

Type of Report:	Feasibility Study
Project:	Feasibility Study of Bela
Client:	K-Electric Limited
Purpose:	Assessment of the technical viability of a 50 MWp solar PV project at Bela, Pakistan
Site location, Country:	Bela (26°08'03.6 N 66°24'33.5E), Pakistan
Operator:	K-Electric Limited
Report number:	202624-Bela-FS-R00
Date of Inspection:	25-05-2021

8.2 Renewable Energy Experts Pakistan
Faisal Dar
60-H Gulberg III
Lahore, Pakistan
Tel: 042 34004416
Email: Faisal.dar@8p2.de

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Table of Contents

RAD

RAD

List of Tables

List of Figures

Revision

Version	Modifications

KAD

I. Confidential and Proprietary Content

8.2 Renewable Energy Experts Hamburg GmbH (named hereinafter: "8.2 Renewable Energy Experts Hamburg") has been commissioned by the client to prepare the following report (the "report"). The report summarizes the findings obtained during on-site visit(s) and/or through the assessment of project related documents which have been provided by the client. The report is confidential and proprietary and has been prepared exclusively for the benefit of the client. The report may solely be used for the intended purpose by the client and his or her professional advisors who are bound by confidentiality obligations. The report shall not inform or protect any third party. It shall not be used by any third party or for any other purpose. The client shall not disclose, publish, copy or otherwise reveal any of the confidential information embodied in the report to any third party without the prior written consent of 8.2 Renewable Energy Experts Hamburg.

II. Assumptions, Limitations and Disclaimer

The report is based solely on findings obtained during on-site visit(s) by 8.2 Renewable Energy Experts Hamburg as well as on information from documents which have been provided by the client until the date of delivery of the report. It is further noted that:

1.) The accuracy of the report depends on the accuracy of the provided information. 8.2 Renewable Energy Experts Hamburg acts on the assumption that the client provided true, complete, accurate, non-misleading and up-to-date information. In general, the information is provided as a copy of the original. 8.2 Renewable Energy Experts Hamburg acts on the assumption that those provided copies are true and complete reproductions of the originals. Neither the authenticity of the information nor the authority of any signatories has been checked. 8.2 Renewable Energy Experts Hamburg acts on the assumption that the information is valid and binding upon the parties thereto.

2.) Regarding summaries, tables and abstracts of documents which have been provided to 8.2 Renewable Energy Experts Hamburg: 8.2 Renewable Energy Experts Hamburg is not in a position to evaluate if these summaries, tables and abstracts are accurate and contain all the information which is important for the final assessment of the underlying facts and data.

3.) The report is based solely on the information and documents provided to 8.2 Renewable Energy Experts Hamburg by the client. It cannot be ruled out that further information and/or documents not provided to 8.2 Renewable Energy Experts Hamburg would have been important for the preparation of the report.

4.) This report offers a thorough assessment; additional resources or specialized expertise may be recommended for specific project aspects.

5.) The report does not assess any legal, commercial, financial, insurance, tax or accounting implication of the information.

6.) Provided that the report refers to or is based on notes, reports, statements, opinions or advice from the client and/or any third party (indicated as such in the report), that party remains solely responsible for the content of such documents or statements. 8.2 Renewable Energy Experts Hamburg expressly does not adopt these notes, reports, statements, opinions or advice from the client and/or any third party as its own.

7.) Certain information which has been provided by the client may be subject to confidentiality agreements. 8.2 Renewable Energy Experts Hamburg acts on the assumptions that all the information has been provided by the client legitimately and that 8.2 Renewable Energy Experts Hamburg is entitled to use the information for the report as well as to communicate the report and/or its content to other project participants in accordance with project related confidentiality agreements. No liability is accepted for non-project related confidentiality agreements.

8.) In the case of information and documents having been provided by the client in languages other than English or German, the assessment of 8.2 Renewable Energy Experts Hamburg has been limited to a plausibility check without detailed analysis and detailed evaluation of such information and documents.

List of Abbreviations:

a	Year
A	**A**mpere
AC	**A**lternating **C**urrent
AJB	**A**rray **J**unction **B**ox (string combiner at structure table)
CE	**C**onformité **E**uropéenne
DC	**D**irect **C**urrent
GJB	**G**enerator **J**unction **B**ox (main combiner before inverter)
EBB	**E**quipotential **B**us **B**ar
EN	**E**uropean Standard
EL	**El**ectro**l**uminescence
F(A)	Surface factor (Flächenfaktor), indicates the value by which the annual global irradiation at module level changes (depending on inclination and alignment of the generator)
GaSC	**G**round **a**nd **s**hort-**c**ircuit
GB Standards	Guobiao Standards
Gh [kWh / m² a]	**G**lobal irradiation [kilowatt hour per square metre and year]
GJB	**G**enerator **J**unction **B**ox
h	**H**our
HV	**H**igh **V**oltage (44kV and higher)
I	Electric Current
IAM	**I**ncidence **A**ngle **M**odifier (adjustment value inclined irradiation)
IEC	**I**nternational **E**lectrotechnical **C**ommission
INV	**Inv**erter; converts the direct current from the solar generator into grid-compatible alternating current.
INVS1	**Inv**erter **s**tatiion **1**
ISFH	**I**nstitut für **S**olarenergie**f**orschung **H**ameln (Institute for Solar Energy Research Hameln)
ISO	**I**nternational **O**rganization for **S**tandardization

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kV	**K**ilo**v**olt
kVA / MVA	**K**ilo**v**olt-**a**mpere / **M**ega**v**olt-**a**mpere
kW	**K**ilo**w**att
kWh	**K**ilo**w**att **h**our
kWp	**K**ilo**w**att **p**eak
LCOE	**L**evelized **c**ost **o**f **E**nergy
LV	**L**ow **V**oltage
MPP	**M**aximum **P**ower **P**oint (point of maximum power = operating point of module, string or even entire solar generator)
MPP-Tracker	Electrotechnical tracking system assuring the optimal operating point
MV	**M**edium **V**oltage
MWp	**M**ega**w**att **p**eak
NOCT	**N**ominal **O**peration **C**ell **T**emperature (practical operating conditions); irradiance on cell surface 800 W/m²; air temperature 20°Celsius; wind velocity 1 m/s
O&M	**O**perations and **M**aintenance
PE	**P**otential **E**qualization
POA	**P**lane **o**f **A**rray
PPA	**P**ower **P**urchase **A**greement
PR	**P**erformance **R**atio
PV	**P**hoto**v**oltaic
PV-Module / Module	Single solar module; smallest, essentially planar assembly of solar cells and ancillary parts, such as interconnections and terminals intended to generate direct current power
Solar generator	Total of all PV strings of a PV power supply system which are electrically interconnected
STC	**S**tandard **T**est **C**onditions Irradiance at module level 1,000 W/m² Cell junction temperature 25°C Solar spectral irradiance distribution AM 1.5 (AM = Air Mass)

RAP

String / Module string	Consists of 23 PV modules connected in series and is the smallest site assembled power unit
TA	**T**echnical **A**dvisor
TC	**T**echnical **C**onsultant
TF station	**T**ransfer station; interface to the power utility with electricity meter for billing purposes
TS	**T**ransformer **s**tation; transforms the alternating current from LV to MV
V	**V**oltage
UPS	**U**ninterrupted **P**ower **S**upply
Wp	**W**att **p**eak, rated power output or peak power at STC is the output data for solar modules or solar plants
IEE	**I**nitial **E**nvironment **E**xamination

General Data

Assignment

Task:	Preparation of a Feasibility Study
Scope of Work:	8.2 REEP was commissioned to perform a feasibility study to evaluate the viability and potential of the site as part of the contract.
Client:	K-Electric Limited KE House, 39-B, Sunset Boulevard, DHA Phase II Karachi Pakistan
Order Date:	21-04-2021
Contractor:	8.2 Renewable Energy Experts Pakistan 60-H, Gulberg III Lahore, Pakistan
Author / Inspector:	Faisal Dar
Second Inspector:	Aitsam Hasan
Report number:	202624-Bela-FS-R00

RAD

Project Identification

Solar plant	50MWp K-Electric Plant at Bela
Coordinates (Lat, Lon)	26°08'03.6 N 66°24'33.5E
Location, Country	Bela, Pakistan
Altitude above sea level	83 m
Plant type	ground mounted
Size of the site	approx. 1.0 km^2 (247 acres)
Expected plant size	50,000 kWp
Grid connection	High Voltage Level,132 kV substation
Electric utility company	K-Electric Limited
General Contractor	to be selected
Project Developer	K-Electric Limited
Site Owner	K-Electric Limited
Road Access	Site is located on main Regional Cooperation for Development (RCD) Highway
Water Access	No proper water access, tube wells with RO plants are recommended

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Executive Summary

This study assesses the feasibility for 50 MWp PV Power Plant in Bela, Balochistan, Pakistan. The assumptions, results and conclusions of this study have been refined during multiple site visits, latest being in June 2021.

PV power plants of large sizes are not common. However, through vast knowledge and experiences acquired over many years, it has become possible to develop highly efficient parks, irrespective of size.

Analysis of data obtained from various sources including several key studies like Geo-Tech, IEE etc. allow us to conclude that the site allocated for power plant is feasible. Components, currently available in the market, are suitable for the environmental conditions of the region.

While the feasibility study addresses project risks, a continuous risk management plan is recommended to ensure smooth project execution. A project timeline of 12 months from financial close until commercial operation is assumed.

It is recommended, that a single axis mounting structure to be considered for this project, as it allows us to increase the yield and capacity factor with minimum cost impact. In the past tracking systems were not common and affordable but now with the advancement in technology, these systems are proving to be a better option as compared to fixed mounting structures.

Support for IPPs, both from the provincial and federal government, is visible by way of infrastructure development in the country. Launching of the first 100 MWp PV plant through the Punjab government owned entity, QA Solar (Pvt.) Ltd, has also lent impetus and encouragement for private IPPs to follow in their footsteps.

Lahore, 29.06.2021

Faisal Dar, BS & MBA

Aitsam Hasan, MSc. (Eng.)

RAD

1 Summary

This feasibility study assesses and summarizes the given information and includes additional results from extensive site visits.

1.1 Technical Project Description

The plant site is located in Bela which lies in the Lasbela district of Balochistan. The plant size would be 50,000kWp which will cover an approximate area of 247 acres. The location of the plant is shown in Figure 1 . Installations in this phase shall be connected to the 132 kV overhead power line. Presently, there is an existing 66kV transmission line which will be dismantled and a new 132kV line would be set up.

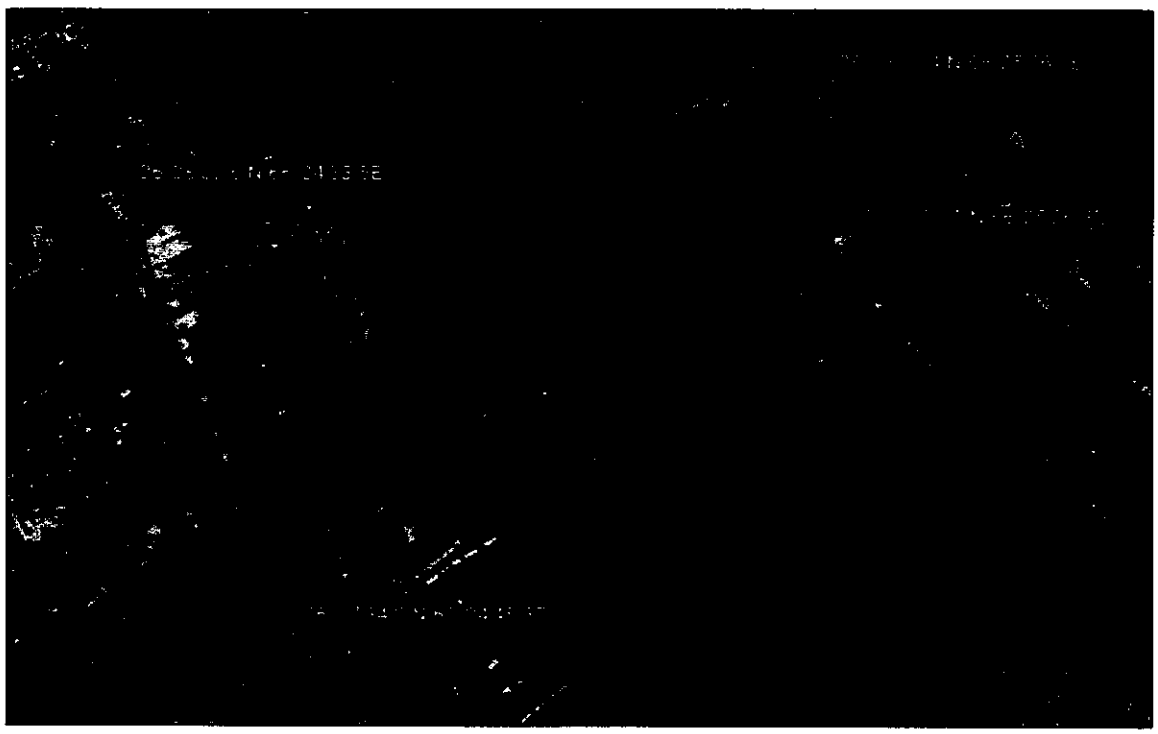

Figure 1 Location of site

1.2 Project Status

The project is under RFP stage i.e. the RFPs have been floated for the Bidders. Moreover, various studies like the Initial Environment Examination, Geo-Tech, topography and

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meteorological study have been conducted for the plant site. K-Electric plans to begin the construction of the power plant by the end of this year.

1.3 Technical Risk Factors for the PV Power Plant

The following table shows the possible risks and their assumed occurrence probabilities associated with the project.

Deal Breaker: high risk not possible to solve
High Risk, possible to solve
Medium Risk, possible to solve
Low Risk, possible to solve
OK

Sr.-No	Subject	Risk	Risk Value	Risk Mitigation
1	Geographic parameters	The exact position for power plant has been finalized. However, there is unwanted vegetation.	Low Risk	Relocation or removal of vegetation has to be considered.
2	Climatic conditions	The climate conditions require robust components. Amongst other criteria, effective cooling, dust/sand filters and abrasive resistant materials shall be utilized.	Low Risk	To be considered in detailed design
3	Environmental Aspects	Precautions against rodents shall be made to protect cabling effectively.	Low Risk	To be considered in detailed design
4	Topography and grounding	Foundations for Buildings have to be well prepared. Screw- or Ramming-Pile foundations present the best options for installation of PV-generator. The	Low Risk	Soil analysis has to be considered for foundation design.

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Sr.-No	Subject	Risk	Risk Value	Risk Mitigation
		overall design, selection of components, and all constructions and foundations, as well as cabling have to be suitable for these conditions.		
5	Irradiation Data	There is a potential bias of satellite irradiance data for this area by 3-5% towards the downside of the expected value.	Low Risk	Ground measurements for at least 6 months should be done before financial close to reduce the uncertainty
6	Transport Access	The accessibility to the PV development area has been established via RCD highway. Construction and service roads within the Plant's area have to be erected.	Low Risk	To be done during detailed design
7	Water Access	A water management plan for construction and operation of the plant shall to be carried out.	Low Risk	To be done during detailed design
8	Grid Access	Currently, there is no available line to get electricity during construction phase. Therefore, a MV power line should be made or diesel generators should be used to provide electricity during construction phase.	Low Risk	MV Power Line should be made or diesel generators should be used. Erection of MV/HV step-up stations to be considered during planning phase.
9	Facility Access	Access to public facilities (fire / police station,	Low Risk	To be initiated

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Sr.-No	Subject	Risk	Risk Value	Risk Mitigation
		hospital) is well available nearby. Fire hydrants have to be established along the roadside in a distance of max. 120 m.		
10	Grid connection	The specific requirements and approval for grid connection need to be confirmed by NEPRA / KE		To be initiated asap

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2 Overview of Solar Photovoltaic Plants and related Technologies

2.1 Basic Principles of Solar Photovoltaic Plants

Solar photovoltaic plants use the global irradiation (GI), which is converted into electric energy. Adequate project locations should offer at least 1,200 kWh/m² per year. The basic concept of a PV power plant is shown in Figure 2 below.

The solar energy collected by the modules is aggregated in several steps until it reaches the inverter. The inverter converts the DC power provided by the modules into AC power to feed into the grid.

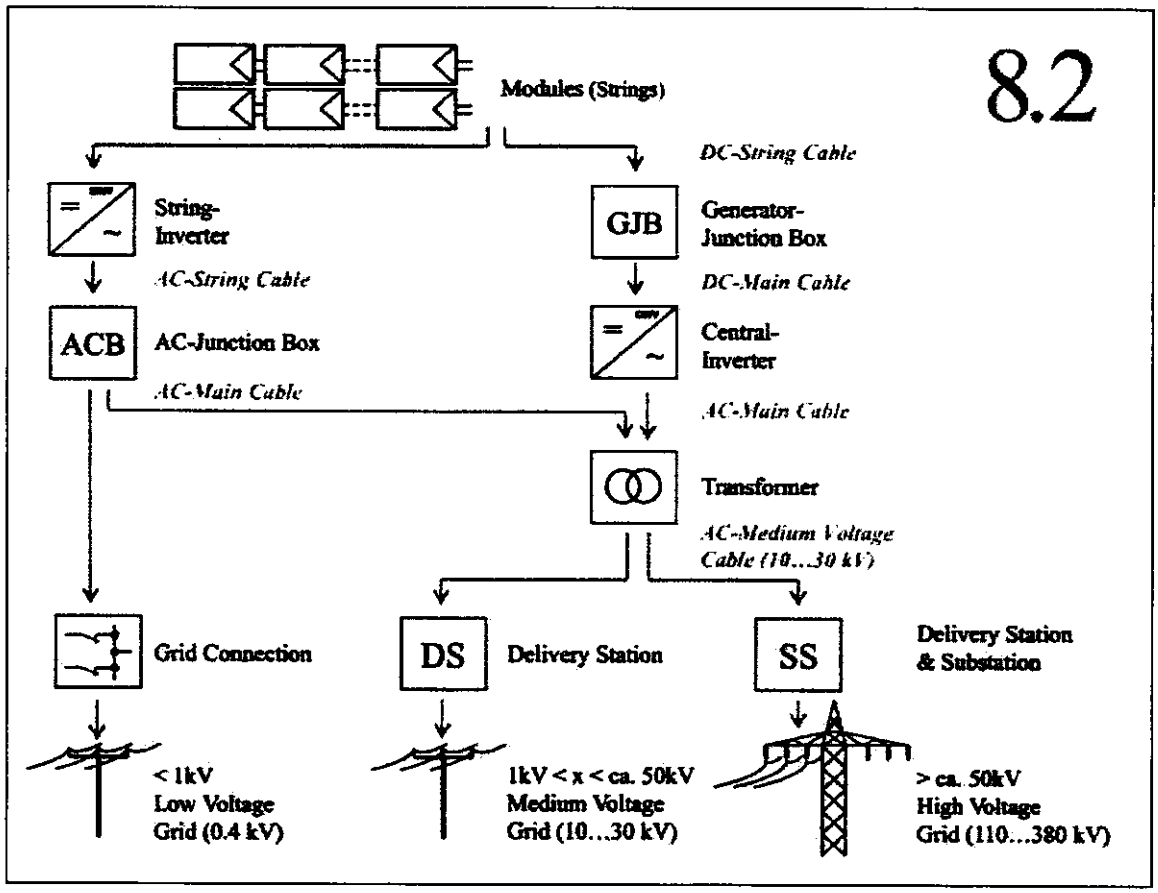

Figure 2: Schematic Overview / Principle of Photovoltaic Systems, Single Line Diagram

2.2 Basic Principles of Photovoltaic Modules

Photovoltaic technologies differ primarily by the type of manufacturing process, which leads to different price ranges, manufacturing cost and performance for the different technologies. Photovoltaic technology is based on the photoelectric effect, in which the photons emitted by the sun get converted to electric power by the semiconductor. The semiconductor is typically made of silicon (80% of the global market).

These absorbed photons hit the atoms, releasing electrons, which causes a chain reaction that multiplies the effect of electrons released. The electrons get lifted from a lower potential to higher. This increase in potential results in the generation of current through potential difference (voltage). The reactions and release of electrons is continuous.

The purity level of the conductor material is important as well as the fact that there are no gaps or defects at the molecular and atomic level of the semiconductor material. As a general rule, the lesser the microscopic defects, the higher the efficiency of power conversion.

The efficiency of a solar cell (η) is the percentage of power from solar energy, incident on the panel, converted to electrical energy. This term is calculated using the ratio of the maximum power point of the cell, Pm, divided by the light power that reaches the cell, the global irradiance (E, in W / m²) and the surface area of the solar cell (Ac in m²).

$$\eta = \frac{Pm}{E \; x \; Ac}$$

As this efficiency varies in different irradiance conditions, the PV industry defined certain conditions for efficiency rating of PV panels. These are called standard test conditions (STC).

Another important standardized variable is the Normal Operating Cell Temperature (NOCT) for modules. This is a characteristic cell value defined as the temperature of the cells, which they reach at an irradiance of 800 W / m^2, an ambient temperature of 20°C and a wind speed of 1 m / s – typically given at open circuit.

Three main solar cell technologies are commercially available:

- Monocrystalline
- Polycrystalline
- Thin Film

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2.2.1 Monocrystalline Technology

The manufacturing process of monocrystalline cells requires more effort in comparison to other technologies. However, these cells offer higher efficiency – typically within 15 – 21 %.

Advantages:

- The loss of efficiency due to the higher temperature is lower than for other types of crystalline module technologies.
- Mature and commercially proven technology.
- Long life of panels.
- Low degradation of maximum 0.1 - 0.5 % per year (manufacturer guarantee is 0.7 % degradation per year; however reality proves to be less).
- Lower installation costs.
- More environmentally friendly than other technologies, for example, some thin film technologies use cadmium. Monocrystalline cells are not harmful to the environment.

Disadvantages:

- The initial investment costs are higher.
- Higher risk of damages (micro-cracks) during transport or during operation at sites with high wind speeds.

2.2.2 Polycrystalline Technology

This technology exists since 1981. The manufacturing process is simpler when compared with monocrystalline technology.

Advantages:

- Lower production costs.

Disadvantages:

- Lower efficiency, due to lower purity of the cell material: 14 – 16 % (module size)
- Because of the lower efficiency, slightly more ground surface area is required to reach the same capacity (as for monocrystalline).
- Higher risk of damages (micro cracks) during transport or during operation at sites with high wind speeds.

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2.2.3 Thin Film Technology

This technology is called Thin Film because only a couple nanometers of the semiconductor material is placed on a substrate material. Hence a very low amount of material is needed. The main semiconductor materials used are:

- Cadmium Telluride (CdTe)
- Copper Iridium Gallium Selenium (CIS / CIGS)

Thin Film technologies have a low market share, except of the CdTe material, with the main manufacturer First Solar. But also CIS / CIGS technologies are having an increasing market, because of their higher efficiency. Depending on the technology, standard thin film module efficiencies have reached 7 - 15%. Prototypes of these technologies reach an efficiency of 16% and more which is expected to be transformed to standard products in the future.

Advantages:

- Easier to manufacture, thus lower costs.
- Homogenous appearance.
- Flexible, hence for use at different applications and surfaces.
- Less affected by high temperatures and shadowing.

Disadvantages:

- Faster degradation rate of up to 0.7 % per year. However, there are some hints that, nowadays, CIS has degradation rates comparable to crystalline modules.
- Lower efficiency leads to greater surface area requirements, for the same capacity.

Table 1: Comparison of the Module Technologies

		Crystalline		Thin Film	
	Parameter	**Monocrystalline**	**Polycrystalline**	**CdTe**	**CIS / CIGS**
1	Voltage rating $-V_{mp}$ and V_{oc}	80 % – 85 %	80 % – 85 %	72 % - 78 %	72 % - 78 %
2	Temperature Coefficient	Higher losses (ca. -0,4 %/K)	Higher losses (ca. -0,45 %/K)	Lower losses (ca. -0,2 %/K)	Higher losses (ca. -0.35 %/K)
2a	Performance Losses for 40°C ambient temperature (~ 60°C	~ 14 %	~ 15.75%	~ 7%	~ 12.25%

		Crystalline		Thin Film	
	Parameter	**Monocrystalline**	**Polycrystalline**	**CdTe**	**CIS / CIGS**
	cell temperature) versus STC conditions (25°C cell temperature)				
3	I-V curve Fill Factor	Higher 70 % - 85 %	Higher 70 % - 85 %	Lower 60 % - 72 %	Higher 70 % - 85 %
4	Module Construction	Framed with structural or anodized aluminium	Framed with structural or anodized aluminium	Normally Frameless	Normally Frameless
5	Module Efficiency	14 % - 20 %	12 % - 17 %	6 % - 12 %	13 % - 15 %
6	Inverter Compatibility and Sizing	High efficiency → less modules → less inverters	High efficiency → less modules → less inverters	Low efficiency → more modules → more inverters	High efficiency →less modules → less inverters
7	Mounting System	Industry Standard practices	Industry Standard practices	Special clips and structures for frameless modules may be needed to hold the module. Mounting system has to be accepted by module manufacturer.	Special clips and structures for frameless modules may be needed to hold the module. Mounting system has to be accepted by module manufacturer.
9	Layout Area	Much smaller size for the same output.	Smaller size for the same output.	May require up to 50% more space for the given project size. The extra space can't be standardized and depends on the design (rows over each other) and the site conditions.	Smaller size for the same output.

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		Crystalline		Thin Film	
	Parameter	**Monocrystalline**	**Polycrystalline**	**CdTe**	**CIS / CIGS**
10	Applications	On grid and off grid usage. More usual as a reference cell and used for scientific tests.	On grid and off grid usage.	On grid and off grid usage.	On grid and off grid usage.
11	PV Plant cell cost	More expensive than polycrystalline and CdTe modules due to high cell efficiency	Cost Higher than CdTe due to higher cell efficiency; Production process easier which lowers the basic cost	Cost Lower due to lower efficiency and double pane glass sheeting	Very expensive
12	PV Plant module unit cost	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses	Cost per kWh comparable	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses
13	PV Plant total cost	Lower Cost due to higher efficiency of the modules (less modules and less mounting structures). Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	Usually lowest cost (Low m^2 cost and less m^2 needed because of the higher efficiency compared to thin film modules). Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	Highest cost due to additional space and mounting structures needed. Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	High cost due to additional space and mounting structures needed. Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)
14	Module power output	Immediate and stable; but zero shadow tolerance, high losses when temperature high and irradiation suboptimal	Immediate and stable; but zero shadow tolerance, high losses when temperature is high and irradiation suboptimal	Requires time to stabilize power output; even slightly shadowed output is feasible	Very good weak light performance (best results of the technologies in winter)
15	Degradation	Around 0.5 % per year	Around 0.5 % per year	Around 0.5 % per year	Around 0.2 % per year

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		Crystalline		Thin Film	
	Parameter	**Monocrystalline**	**Polycrystalline**	**CdTe**	**CIS / CIGS**
16	Market perspective	Standard technology many providers.	Standard technology, many providers	One big provider (First solar)	Little number of providers.

2.3 Mounting structures and tracking systems

The photovoltaic modules can be installed on fixed structures or on moving structures tracking the sun. Trackers can be implemented either as a single axis system or as a dual axis tracking system.

2.3.1 Fixed mounted structure

Fixed structures are usually tilted to face south (north in southern hemisphere) with a fixed angle depending on several parameters e.g. the location. Nowadays, more and more PV power plants are installed with modules tilted to east and west usually with tilt angles between 10° to 15°. This installation type would offer lower peak capacity. However, the generation curve would be less spiked and allow an energy generation distribution to be more spread out over the day. The row shading of these installations is less, such that the rows can be installed closer to each other and more modules can be installed on the same area as it is possible with modules facing south. Depending on the construction, the installation costs of east-west installations are often lower than south oriented systems.

Figure 3: Fixed Mounted Structure facing south or north

Figure 4: Fixed Mounted Structure facing east and west

2.3.2 Tracker systems

The aim of trackers is an optimized adjustment of the module surface to the sun during the day to increase the total irradiation onto the module surface. This can also lead to

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greater efficiency in converting solar energy. Commonly used tracking systems are single and dual-axis trackers.

Dual-axis trackers follow the sun in azimuth and tilt. With it, the sun can be exactly tracked over the course of the day to achieve an optimized irradiation angle. Dual-axis trackers have one pole which is carrying and tracking a frame with modules mounted on. Usually, between 20 and 30 modules are installed on one tracker. The installed module capacity on the plant has to be lower than with fixed mounted structures to avoid overwhelming shading losses. Dual-axis trackers are almost independent of the landscape.

Figure 5: Dual-Axis Tracker

Single-axis trackers usually follow the azimuth of the sun. Several construction types exist. One is similar to dual axis trackers with one pole carrying a module frame (vertical axis system). In that case, the module tilt is fixed and the pole is used as rotation axis. The tilt depends on the location. For the location Bela (26°08'03.6 N 66°24'33.5E) the optimal installation would have a tilt of approximately 28°.

Because the single-axis tracker, described above, needs similar space as dual axis trackers, nowadays another type of single axis tracker is in use. This one has a horizontal rotation axis oriented from south to north or from east to west. The modules are installed parallel to the rotation axis. Depending on the way of installation and length of horizontal axis the requirements to the flatness of the area can be higher, because the horizontal axis itself is not able to compensate irregularities.

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Figure 6: Single Axis Tracker, vertical Axis

Figure 7: Single Axis Tracker, horizontal Axis

The decision to choose any of the three types of mounting structure is based on a technical and economical evaluation. When choosing a tracking system, the extra energy generation in combination with the energy price must be compared with the additional investment and maintenance costs required for tracking systems.

In general, tracker solutions gather more irradiation per installed module capacity than fixed mounted modules. The peak of the production curve is wider during the day compared to fixed mounted modules. But the installation effort is higher for tracker solutions based on their design. More attention has to be laid into the resistance against heavy storms.

Table 2: Comparison of the Mounting Systems

	Parameter	Fixed-tilted		Horizontal single-axis tracker		Vertical single-axis tracker	Dual-axis tracker
		South faced	East-west	East-west	North-south		
1	System costs	Lower than for tracker solutions, as no mechanical parts		Higher costs than fixed-tilted. High differences between the manufacturers.		Higher costs than horizontal tracker	The highest costs of all systems
2	Installation costs	Lower than for tracker solutions, as less complex system. But the difference regarding the total installation cost is minimal compared to the horizontal tracker.		Higher costs than the fixed tilted system, but lower than the vertical tracker.		Higher installation costs, especially for the commissioning phase.	Higher installation costs, especially for the commissionin g phase
3	Maintenance costs	Lower than for tracker solutions, as no mechanical parts		Depends on the selected manufacturer (options without mechanical parts available), but cost higher than fixed-tilted		Higher costs based on the mechanical parts	Higher costs based on the mechanical parts

	Parameter	Fixed-tilted		Horizontal single-axis tracker		Vertical single-axis tracker	Dual-axis tracker
		South faced	East-west	East-west	North-south		
4	Max. pivoting angle range	10° to 35°	5° to 20°	-120° to 120°	-120° to 120°	Fixed tilt for site 28°, vertical axis -180 to 180°	Motorized tilt -00-80° and vertical axis -180° to 180°
5	Site requirements	System is adaptable to uneven ground and high slopes. Standard system up to 35°(North/South) and 10°(East/West)		Ground might be uneven with slopes up to 28°	Ground might be uneven with slopes up to 28° The system makes just sense if the site is not facing South.	Ground might be uneven but sites with higher slopes are not suitable without huge extra effort	Ground might be uneven but sites with higher slopes are not suitable without huge extra effort
6	Space requirement	Several rows can be installed over each other. Space requirement low	No row shading, so the rows can be installed near to each other. Best space requirement	Installation of rows over each other is limited, but space requirement not much higher than fixed- tilted	Installation of rows over each other is limited, but space requirement not much higher than fixed- tilted	The distance between the trackers must be high. Space requirement is high	The distance between the trackers must be high. Space requirement is high
7	Space factor (Wp/m2)	~50 - 75	~60 - 90	~40 - 65~	~45 - 55	~15 - 25	~15 - 25

2.4 Inverter Technology

Because photovoltaic panels generate DC electricity, it must be converted to alternating current before it can be fed into the grid. This is achieved by an electronic device called inverter.

State of the art inverters offer a broad range of operational stages, which generally fulfill all the requirements of the international grid codes in terms of fault-ride-through and reactive power provision. Inverter stations provide a protective shell in which PV-strings can be connected to inverters. Centralized inverters typically have a capacity from 500 kW to 3125 kW of DC PV-Power, depending on the size of inverter.

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From the inverter stations the AC power is stepped-up by a MV or HV-Transformer, and then connected to a medium or high voltage grid (for instance 132 kV and 220 kV as in Pakistan).

Regarding the inverter system, two design types can be selected: a central or a decentralized design.

2.4.1 Central Inverter

Use of central inverters is the standard practice in large PV plants. The strings are combined in string combiner boxes and several combiner boxes are connected to an inverter. Typically the output power of central inverters is between 500 kW and 3125 kW. The inverter can be installed in a compact station, in a container or as an outdoor system depending on the space for installation and the transport opportunities.

Typically, central inverters have a better price per MW and have less start-up and operation problems. But they require a specific training of the electricians for the commissioning procedure and in case of failures.

The efficiency is around 1 - 2% higher than of string inverters.

2.4.2 String (decentralized) Inverter

String inverters are commonly used in small sized PV plants but there is also a trend to use them in large scale PV plants. The strings are connected directly to inverters, which can be up to 225 kW.

String inverters can be installed and exchanged by basic educated electricians and spare parts can be stored near the side. These inverters are easy to transport and handle. In complex terrain, with a lot of shading, the benefit is lesser module strings and therefore fewer modules are combined per inverter. Therefore, in case of partial shading of the PV generator, the mismatch losses are less because fewer modules are affected.

2.5 Control System

A PV plant is typically controlled by a SCADA System (Supervisory Control and Data Acquisition) so that it can be remotely managed and supervised. However, for preventive, planned and corrective maintenance, adequate staff and qualified contractors must be identified for the Operations & Maintenance (O&M) of the plant.

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3 Site Description and Assessment

3.1 Geographic Parameters

The plant site is in the southern region of the Balochistan province in district Lasbela about 20kms from main town Bela, see Figure 8 and Figure 9. Lasbela is a coastal district of Balochistan, it contains five tehsils with Bela being one of them.

Figure 8 Overview of Location / Region in Pakistan

Figure 9 Site Map showing Road Access

As it is a coastal district, there is some unwanted vegetation on the planned solar plant site which may cause shading of the solar generator (Figure 10 and Figure 11). This may cause temporary impact on some parts of the generator field. The vegetation will have to be relocated or removed before any construction begins.

Figure 10 Vegetation at site

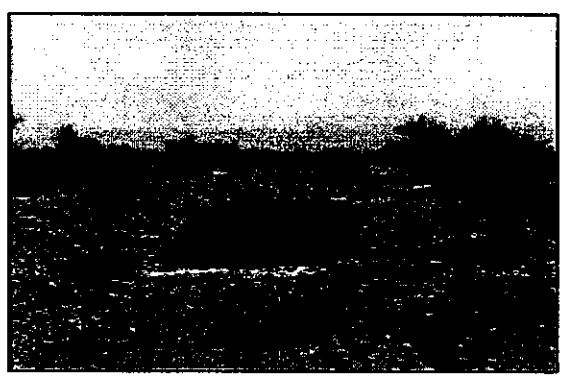

Figure 11 Vegetation at site

Geographic parameters	The exact position for power plant has been finalized. However, there is unwanted vegetation.	Relocation or removal of vegetation has to be considered

3.2 Climatic conditions

Climatic conditions have an influence on construction and foundation layout as well as energy production. The Balochistan Meteorological Department has only one weather station throughout Lasbela district. However, to evaluate the climate conditions of the plant site a detailed Meteorological study was carried out. From the study it was observed that the site has warm summers with average high temperatures up to 36° C.

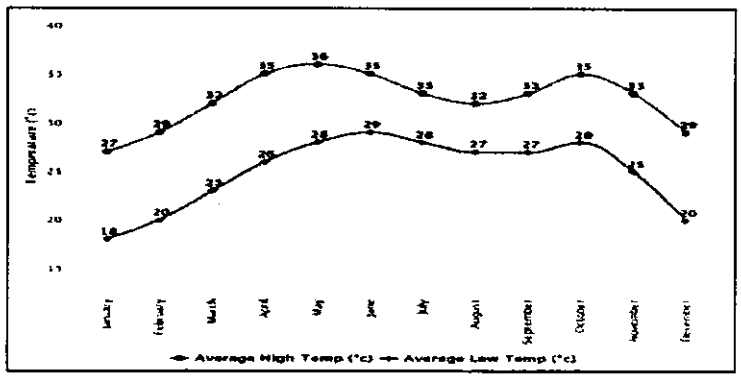

Figure 12 Site Temperature Range (source: Meteorological Study)

The monsoon season lasts from May through September with a peak in July and August. 60 – 70 % of the yearly rainfall comes in these months. The average rainfall per year in balochistan can range from 50 – 200 mm. In the Figure 13 the monthly precipitation for the plant site is shown.

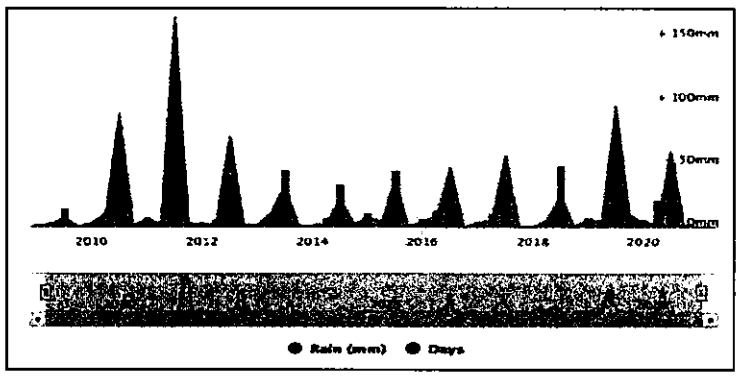

Figure 13 Precipitation at site (source: Meteorological Study)

Drainage from the site seems not to be an issue as the water will pass through the culverts in RCD highway. However, two dried torrential streams are found on the plant site for

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which detailed flooding analysis is carried out in the meteorological study. According to the study one of the torrential stream is activated in the high rainfall season, therefore a proper drainage plan should be prepared keeping in view the 100 year return flood period.

There is an average of 9 hours of clear sky per day throughout the year and 2900 - 3300 sun hours annually.

As per meteorological study, the average wind speed in this area peaks at 35 kmph whereas average maximum wind speeds range between 30 to 35 kmph.

Micro climate effects can cause dusty and windy conditions which should be evaluated more thoroughly. Broken up surfaces cause swirling dusts at wind speeds of higher then 5 - 6 m/s.

Also, frequent dust storms are observed in the area which might increase the soiling loss for the power plant and have an overall negative impact on its yield.

Impact on the project:

The inverters for this site should be designed for high ambient temperatures and all of the equipment including inverters, transformers etc. should be installed on an elevated terrain. Dusty conditions should be considered for the design of filters for all electrical equipment and buildings. The position of the modules and other structures should be chosen so that an intelligent drainage and seepage network can be incorporated into the site.

Climatic conditions	The climate conditions require robust components. Amongst other criteria, effective cooling, dust/sand filters and abrasive resistant materials shall be utilized.	Low Risk – to be considered in detailed design

3.3 Other Environmental Aspects

No industrial activities are present nearby. There are few agriculture activities around the site. Pakistan Environment Protection Agency (Pak-EPA) has no regulations or requirements for solar power generation (PEPA Regulations 2000). Low rainfall and some wind cause slight erosion of soil. No protected wild plants or animals are reported at the site. The ambient air and noise quality meet the required National Environmental Quality

Standards (NEQS) limits. Further details of environmental impact are highlighted in Initial Environmental Examination (IEE) of the plant site.

Potential risk of earthquakes is a clear point of consideration as the site is located in a region which is in the vicinity of the plate boundaries. Historical data shows that large magnitude earthquakes have occurred within more than 150 km radius from project area. The peak horizontal acceleration for a return period of 475 years is 0.34g. More information can be found in the Geotechnical study of plant site.

As the plant site is a large area so usually rodents live in such areas. They are known to eat plastics and cables. However, during site visits, only holes in the ground were seen.

Impact on Project:

No critical aspects can be detected as long as all obligatory safety rules are implemented e.g. for oil pollution from facilities and transformers.

Environmental Aspects	Precautions against rodents shall be made to protect cabling effectively.	**Low Risk – to be considered in detailed design**

3.4 Topography and Grounding

The topography of the plant site is mostly flat with some uneven areas. The soil is mostly rocky with dry shrubs growing on it.

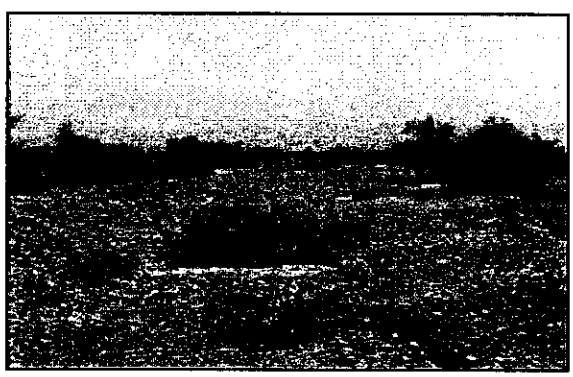

Figure 14 Vegetation

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The natural soil layer is not suitable as the foundation bearing layer and the soil has to be prepared for heavy transport traffic, as frequent traffic is likely to loosen the soil surface. Details of soil can be found out in Geo-Tech study.

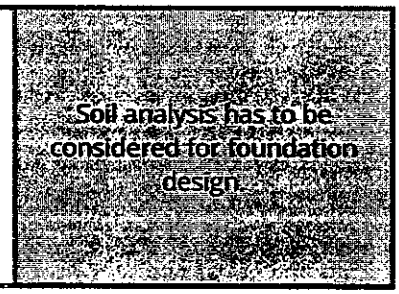
Table 3 Soil classification

Sr. No.	Test Pit No.	Sample No.	Depth (m)	Grain Size Analysis				Atterberg Limits		Sulphate Content (%)	Chloride Content (%)	pH Value	Soil Classification (USCS)	
				Cobble	Gravel	Sand	Fines	LL	PI				Group Symbol	Group Name
				%	%	%	%	%	%					
1	TP-1	BS-1	0.0 - 3.0	6.0	47.0	38.0	9.0	Non- Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
2	TP-2	BS-1	0.0 - 3.0	11.0	35.0	47.0	7.0	Non- Plastic					SP-SM	Poorly Graded Sand with Silt and Gravelwith Cobble
3	TP-3	BS-1	0.0 - 3.0	3.0	46.0	45.0	6.0	Non- Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
4	TP-4	BS-1	0.0 - 3.0	2.0	49.0	45.0	4.0	Non- Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel
5	TP-5	BS-1	0.0 - 3.0	8.0	37.0	50.0	5.0	Non- Plastic		0.04	0.14	7.2	SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble
6	TP-6	BS-1	0.0 - 3.0	0.0	29.0	55.0	16.0	Non- Plastic					SM	Silty Sand with Gravel
7	TP-7	BS-1	0.0 - 3.0	22.0	52.0	21.0	5.0	Non- Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
8	TP-8	BS-1	0.0 - 3.0	15.0	42.0	39.0	4.0	Non- Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
9	TP-9	BS-1	0.0 - 3.0	6.0	35.0	53.0	6.0	Non- Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble
10	TP-10	BS-1	0.0 - 3.0	7.0	39.0	45.0	9.0	Non- Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble

The thickness and resistivity values of the subsurface layers of soil are quite variable therefore, the detailed findings of resistivity in the Geo-Tech study should be used for the designing of earthing system.

Impact on the project:

Overall conditions are more or less standard and various solutions can be settled to implement the project.

Topography and grounding	Foundations for Buildings have to be well prepared. Screw- or Ramming-Pile foundations present the best options for installation of PV-generator. The overall design, selection of components, and all constructions and foundations, as well as cabling have to be suitable for these conditions.	

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3.5 Meteorology including Solar Resource

Pakistan is exposed to strong solar radiation, long hours of sunshine, and abundant solar energy resources. The annual sunshine hours range between 2900 - 3300 hours, with a daily average of 12 hours of sunshine.

Lasbela District is located in the south of Balochistan Province. For this location, the average sunshine duration sums up to 8.9 hours per day resulting in approx. 3250 hours of sunshine per year. The basic available meteorological data and the sunshine hours for year 2020 of the Meteorological Station of Lasbela district have been collected.

Table 4: Climate Data of the Region (Extract)

	Average daily Sun hours *	T Amb	Wind Vel
	h	°C	m/s
January	7.7	15.7	1.71
February	7.9	19.1	1.99
March	8.2	25.3	2.1
April	9.0	30.1	2.6
May	9.4	34.4	3.3
June	9.3	34.3	3.9
July	8.4	33.2	4
August	6.9	31.6	3.4
September	10	30.5	3
October	10.3	28.7	1.79
November	9.1	22.5	1.4
December	8.4	17.3	1.5
Annual average	2900-3300	26.9	2.56

Source: Meteorological Station Lasbela District

Sun hours: Hours

T Amb: Average ambient temperature (Meteonorm 8.0)

Wind Vel: Average wind velocity (Meteonorm 8.0)

For the first part of this feasibility study, we have used the solar irradiance resource from the Meteonorm 8.0 database. To determine the best data for the solar irradiation predictions, we will also analyze SolarGIS. Generally, different sources refer to the same satellite and ground measured data. In the following paragraphs, we will describe the differences and define the preferred meteorological dataset for the yield assessment.

The high level of global horizontal irradiation with the typical shape of seasonal variation through the monthly values shows differences of only 2 - 3% on annual basis between different sources.

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SolarGIS provides irradiation data based on calculations from satellite images. The database represents long-term global data (1999 to 2021). The spatial resolution is 250 m. SolarGIS typically has an uncertainty of 3.5 % based on experiences in other countries of the MENA region and Middle East. For Pakistan and the region of Balochistan, we calculate an uncertainty of 5% due to missing close reliable reference meteorological stations with measurement for irradiance values.

Meteonorm uses several sources e.g. different satellites and ground stations for mean values. The main time period is 1996 – 2015 (totally 1942 stations). The most important source of radiation data is the Global Energy Balance Archive (GEBA, https://protos.ethz.ch/geba/). This database is also used to extract uncertainty, variability and trend information (770 stations are used for this). Additionally the global radiation values of the stations of NREL's TMY3 database (http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2010/tmy3/) with the highest quality level (NSRDB class I) have been included in the Meteonorm database. Interpolation of global radiation data is based on a mixture of ground measurements and satellite data. The calculation of the uncertainty values of global radiation is based on (1) uncertainty of ground measurement based on long term variability of local climate, (2) uncertainty of interpolation of ground measurement and uncertainty of satellite based data and (3) on uncertainty of splitting into diffuse and direct radiation and inclined planes. Four parameters have been classified: (1) duration of measurement period, (2) standard deviation, (3) decadal trend and (4) end of measurement period. Interpolation of ground stations is modelled with help to the nearest station.

High latitudes and high albedo would increase the uncertainty even more which is not the case for the site. The uncertainty of satellite data is given by Meteonorm with 3 - 8 %. The overall uncertainty calculated internally by the Meteonorm software comes out with 3.1% based on the available 20 years long term data set for this region for global horizontal irradiation (Ghi).

For a more exhaustive overview, the different sources can be viewed in detail in Table 5 and Figure 15.

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Table 5: Results from different Sources for Irradiance Data

Irradiation Sources Bela Average monthly sum	Meteonorm 7.3 1996-2015 GlobHor kWh/m²	Solar GIS 1999-2021 GlobHor kWh/m²
January	122.6	128.9
February	130.8	144.1
March	176	202.9
April	188.8	218.8
May	204.2	196.7
June	190.5	171.1
July	162.5	163.1
August	153.5	179.3
September	165.3	179.3
October	157.3	169.9
November	129.7	138.8
December	119.4	127.4
Annual sum kWh/m²*a	1900.6	2029.6

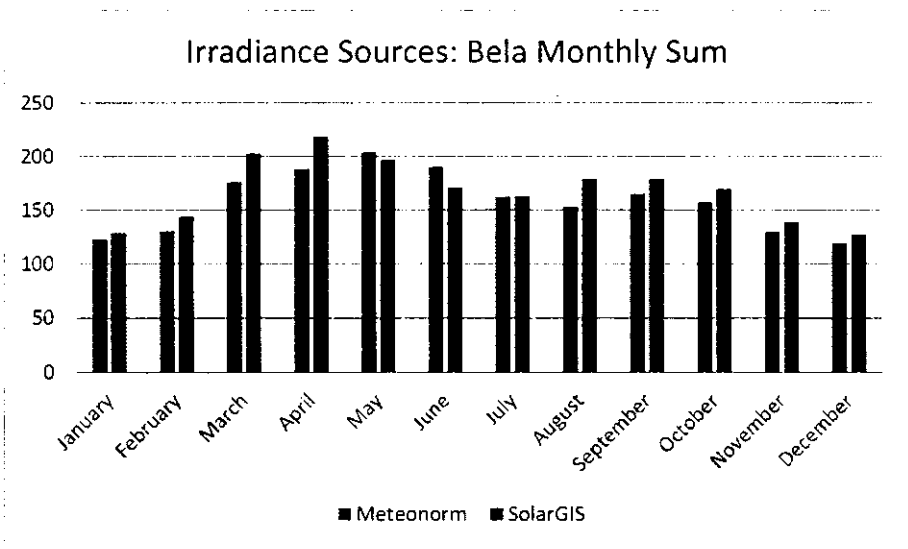

Figure 15: Comparison of Results from different Sources for Irradiance Data

Based on the consultant's experience, these irradiance values are in close proximity and deviate only slightly. For energy yield analysis in this Feasibility Report, Meteonorm and SolarGIS data will be used.

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Irradiation Data	There is a potential bias of satellite irradiance data for this area by 3-5% towards the downside of the expected value	Ground measurements of at least 6 months should be done before financial close to reduce the uncertainty

3.6 Transport Access

The site lies on the main RCD highway and has a link road too. The nearest airport is located at a distance of 180 km at Karachi. Sea freight may be shipped to Karachi harbor and then be transported to the site via road.

Figure 16 Access Road (RCD Highway)

Transport Access	The accessibility to the PV development area has been established via RCD highway. Construction and service roads within the Plant's area have to be erected.	Low Risk - to be done during detailed design

3.7 Water Access

Water will be required for dust prevention during the construction phase and for cleaning of modules in the operation phase.

3.7.1 Water Demand

The majority of the water will be needed for regular cleaning of the modules. Furthermore, small amounts of water will be needed for domestic consumption (e.g. living), landscaping and dust prevention on roads / tracks. Wet cleaning of the modules is supposed to take place on a monthly basis. The total demand of fresh water is estimated to be approx. 45325 m³ / year including the amount for domestic, landscaping and dust prevention consumption for the power plant. The daily water demand equals to approx. 12.5 m³ / day per 50 MWp Solar power plant.

However, after extensive analysis of the site conditions, it is suggested that the modules be cleaned via dry brushing at least once per week to ensure maximum output. In case of weekly wet cleaning, the water demand can rise further.

3.7.2 Water Supply

Inquiries from the locals living in surroundings of Bela site, indicates that reasonable quality of ground water is present at about 60m to 70m depth below the existing ground level. A solar tube well has been installed in nearby village which is about 0.5km to 1km from the project site. For a sustainable source of water, it is better to install a tube well with RO plant within the project site boundary after performing detailed ground water survey.

3.7.3 Water Reuse / Treatment / Disposal

The water utilized for cleaning the modules will not be reused or treated after the module cleaning procedure. The water will be let to seep away into the ground, as catching the water before dropping off the modules is a very complex process. As environmental pollutants, e.g. dust, sand, and bird droppings, are mixed within the used cleaning water, those naturally occurring elements are not regarded to give any negative influence to the PV plant's soil. However, in long term of solar plant operations, it can be efficient to apply some type of water recycling system to reduce fresh water consumption for module cleaning process. However, the module manufacturer's specifications regarding water quality have to be respected.

Water used for domestic supply is supposed to be collected in underground waste water storage tanks. A procedure to recycle grey water, e.g. from lavatory, is not scheduled currently, but recommended to be applied for efficient reduction of fresh water consumption.

A waste water treatment plant is currently not intended, but recommended to be applied. Waste water from domestic use shall not be dissipated into the ground without treatment.

3.7.4 Water Management Plan

We recommend carrying out a water management plan for construction and operation of the solar power plant. In particular:

- Water demand of the plant (e.g. for construction and cleaning of the modules).
- Water supply to the plant (based on the hydrological situation in the area).
- Water reuse / recycling schemes (e.g. waste treatment, storage ponds...).

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- Waste water discharge (e.g. quality and amount of waste water, run-off systems, etc.).
- Water-related (hydrological) environmental impact analysis.

Water Access	A water management plan for construction and operation of the plant, as specified above shall to be carried out.	Low Risk - to be done during detailed design

3.8 Grid Access

Currently, there is a 66kV line which would be dismantled and a new 132kV would be established to export power from the solar power plant. A detailed grid interconnection study is recommended.

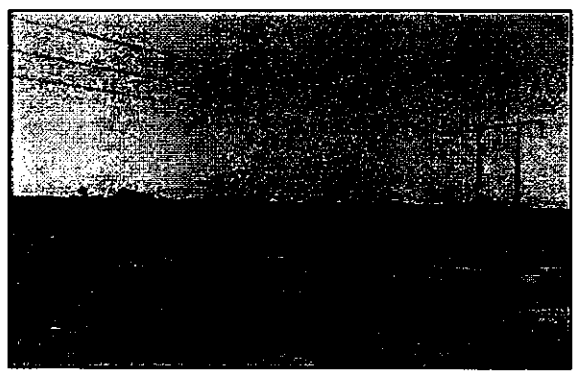

Figure 17 Existing 66kV line

Grid Access	Currently, there is no available line to get electricity during construction phase. Therefore, a MV power line should be made or diesel generators should be used to provide electricity during construction phase.	MV Power Line should be made or diesel generators should be used. Erection of MV/HV step-up stations to be considered during planning phase.

3.9 Facility Access

The PV development site is near to Fire Brigade office and police station in Bela.

It should be checked if the fire station can meet the fire protection requirements of the solar power plant, to conclude, if a dedicated fire station is required or not.

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According to the features of the plant site, and on the basis of the relevant specifications of Code of Design on Building Fire Protection and Prevention (GB50016-2006), fire hydrants will be provided in the general services area and the 132 kV step-up station. The outdoor fire hydrant shall be erected along the roadside, and the arranged distance between the hydrants shall be no more than 120 m. The fire devices shall be designed according to the secondary load power supply standard, using double circuit power supply and automatic switching at the end. The fire devices shall use fire protection or fire-resistant cables. The fire protection and firefighting system is part of safety requirement and shall be designed and provided by EPC contractor.

There are nearby hospitals therefore, the distance to the hospital is acceptable. An emergency kit has to be provided on site, along with an emergency guideline, the emergency call number and a description of the travel route to enable a rapid aid.

The distance to the police station is also acceptable, but it is recommended that the site has its own full time security staff located near or on the site.

Facility Access	Access to public facilities (fire / police station, hospital) is well available nearby. Fire hydrants have to be established along the roadside in a distance of max. 120 m.	**To be initiated**

4 Plant Layout and Description of Technical Equipment

4.1 Power Supply Infrastructure

Presently, there is no proper power infrastructure at plant site. An 11 kV overhead power line should also be made available for auxiliary loads or diesel generators should be used. For sufficient power supply during construction phase, it is recommended to extend the power line.

4.2 Power plant Technology Configurations

In general, several technology configurations can be implemented.

The most economical technology configuration is a fixed mounted module installation with a tilt to the south with central inverters. The density of installed PV power to ground space is highest and the specific energy output by installed PV power is lowest.

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Alternatively, a dual axis tracking system represents the complete opposite:

- It is more expensive, with highest O&M cost.
- It has the lowest density of installed PV power to ground space, and
- The highest specific energy output of installed PV Power.

A compromise of these two technologies lays in a single axis tracking system. This option offers a good cost to power ratio. Due to this insight, several versions of single axis tracking systems (with horizontal North-South axis) may be compared.

Single axis tracking installation is considered for the purpose of this feasibility, because it offers the perfect mix of cost and production.

Pile rammed substructure is the most recommended type of foundation for PV racks.

4.3 Basic System Design

In the following paragraphs, the main assumptions and the components preselected for the Energy Yield Assessment can be found.

4.3.1 Preliminary Layout

The preliminary layout shows a typical layout for a solar plant of this size. The final layout will be defined only once the final choice of modules, structures and inverters is made.

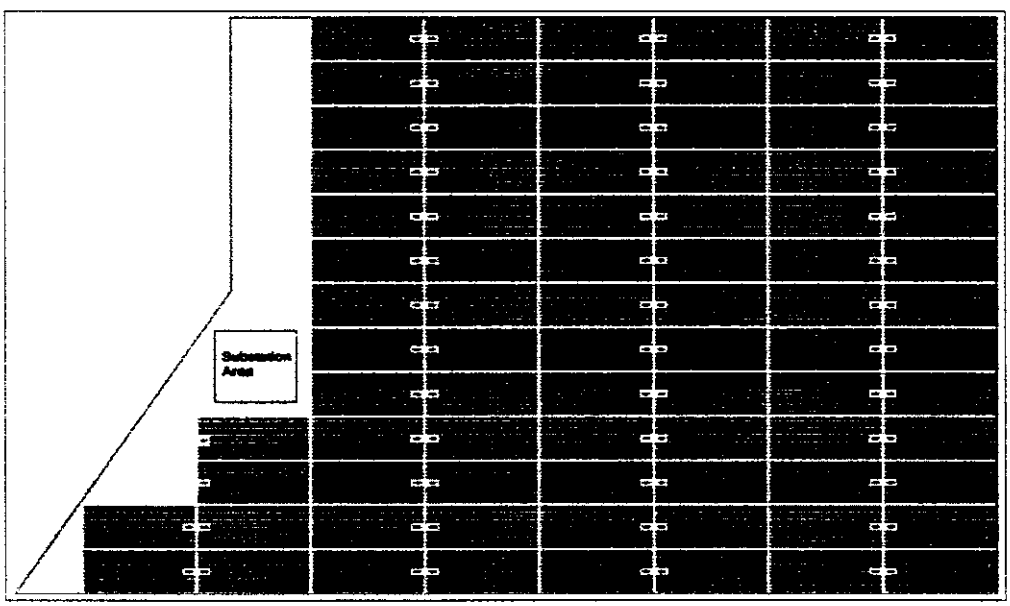

Figure 18: Schematic Overview PV Plant (excerpt)

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4.3.2 Modules

The 144-cell Mono-crystalline PV modules, with a positive tolerance were selected for the system design. This type of module is state of the art. Such modules are new in the market but are available in sufficient amounts to implement a 50 MWp solar plant.

Quality of the modules will be assured by a pre-construction factory-audit of the manufacturer, laboratory testing of recently produced modules and on-site testing of modules delivered to construction site.

4.3.3 Structure

For mounting structure, a single axis EW tracking is selected. Single axis tracking offers more yield and does not has a dramatic impact on the overall project cost. Tracking systems are becoming common and have proven their reliability in several PV projects throughout the world.

The tracking structure has a maximum angle of 60° and minimum angle of -60° to enable sun exposure and high energy yield.

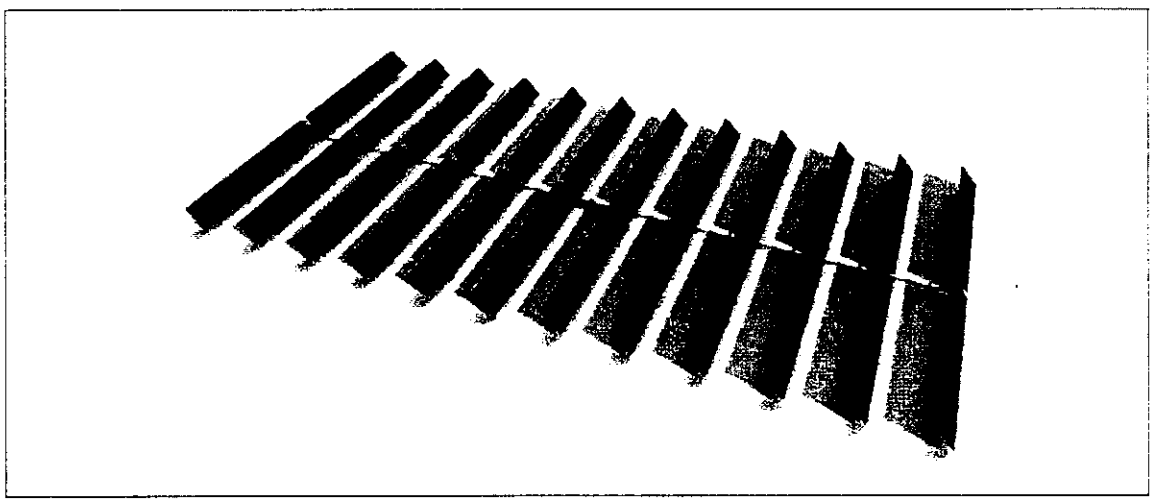

Figure 19: Schematic of PV Mounting Structure

4.3.4 Cables

The electrical interconnection between PV modules and inverters is designed to be made of minimum 4 mm² copper cable. This is a standard approach according to international best practice and suitable for the project.

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4.3.5 Inverters

For this feasibility study centralized type inverters were selected. This type of inverter is a typical and high quality state of the art product suitable for the project. Inverter quality shall be secured by a factory-audit of the manufacturer before production and delivery.

Centralized type inverters were selected due to their capacity of dynamic grid support, which is a relevant point in the project site. Additionally, the specific purchase price per MW is lower, and efficiency is higher than for decentralized inverters.

4.3.6 HV Station

The substation is considered as a critical part of the project concerning the time line for its construction. Availability and delivery time of the chosen components and design criteria, acceptable to KE, have to be considered.

A standard substation consisting of a Medium Voltage part including HV transformer, HV portion of the plant, double bus bar single breaker scheme designed for HV portion is recommended for utilization in this project.

4.3.7 Monitoring

A SCADA system of high temporal resolution (minimum should be 15 Minute average values) is recommended to be adopted. It is also recommended to measure fine resolution of plant components, e.g. in one channel combination of two module strings only.

To achieve an optimum energy yield, it is recommended to keep staff operating on site for continuous monitoring of the performance of the solar plant.

4.3.8 Security

To secure the site against theft and vandalism as well as for staff's protection, a 2m high fence at least with barbed wire on top should be erected. As an alternative, a solid concrete wall should be erected. Additionally, a video surveillance system connected to a maintenance office is recommended to be installed to remotely supervise activities on site.

4.4 Required infrastructure developments

- Water tube wells should be established to provide water for the constructions phase.
- Either an 11kV line should be set up to provide electricity during construction phase or diesel generators should be used.

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5 Grid interconnection

5.1 Assessment of possible electrical Faults and their Impact on the Power Network

In developed countries, many years of experience with grid connected renewable energy power plants and previous experiences in Pakistan have shown that it is possible to integrate these power plants into the grid under consideration of clearly defined technical aspects. PV plants, especially, are also able to offer reactive power 24/7 and can thereby help stabilize the grid.

5.2 Possible electrical Faults and their Impact on the Grid

In general, measures have to be taken in order to assure that all types of electrical faults of the PV plant are managed in accordance with the relevant national grid code (NEPRA Grid Code June-2005) and potentially existing so-called "Technical Conditions for Grid Connection" of the corresponding grid operator. The needs can be fulfilled by selecting the right safety equipment and a safety concept which includes all components from inverter up to the grid connection point.

5.3 Impact on the Evacuation Network

With respect to the transmission grid at high voltage level, the conditions for safe grid integration 50 MW nominal AC power needs to be formally assessed externally and signed off. The corresponding key indicators for this assessment are the short circuit power and the impedance angle of the grid at the grid connection point.

5.4 Balancing Power

Due to their very nature, PV plants as such are not suitable for providing balancing power. According to the installed inverters, the PV plant has to be operated far below nominal power at certain times of the day to ensure the requested reactive power. Usually, inverters react slowly to the request to change the share of reactive power. Due to the slow reaction of the inverters and the need for fast power balancing, a compensation system has to be implemented. The PV plant needs to be formally assessed, so that

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adequate measures to provide the required balancing power can be implemented and an overall monitoring and control system installed.

5.5 Grid control Strategies

Basically grid control strategies can only be set up with a somewhat clear understanding of the potential energy mix of a specific region in the future. Once this mix is known at least on "target basis", it is feasible to exploit the potential of modern inverters to the full extent, for instance their capabilities of providing reactive power on demand in more or less real time or in case of low voltage.

5.6 Technical Specifications

Prior to setting up technical specifications for the grid connection, a comprehensive analysis, of the existing grid codes, relevant guidelines and national regulations, has to take place with the target to establish the exact conditions for a safe, technically and economically viable grid connection of the solar plant. Following this analysis, detailed technical requirement specifications, concerning the behavior of the grid connected solar power plant, can be set up in order to make sure that faults and deviations from the established set of conditions result in predefined actions. Key issues in this respect are:

- Decoupling of the solar plant in case of short circuit and voltage or frequency deviation above or below defined thresholds
- Dynamic grid support in case of short term voltage drops
- Provision of reactive power and control of effective power as required

5.7 Approvals

There has to be a grid integration and connection study to confirm the conditions of integration of this 50 MWp solar plant. In particular:

- Potentials and limitations for the integration of the power product of the different scales of SPV plants into the daily and yearly load curves.
- Quantitative and qualitative needs and already available grid-inherent potentials to provide balancing power.
- Quantitative and qualitative needs for additional balancing power.
- Further risks and necessary risk mitigation measures for ensuring grid stability.

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- Required power quality output parameters of the plant.
- Technical requirements of inverters, transformer, switching devices, circuit breakers etc.
- Control parameters and control interfaces to the grid operators control schemes.
- Further risks and necessary risk mitigation measures avoiding and handling electric failures of the plant.

Grid connection	The specific requirements and approval for grid connection need to be confirmed by NEPRA / KE	[redacted]

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6 Energy Yield Assessment

6.1 Solar Irradiation Data

The given sunshine hours can only indicate the volatility through the years which is around 20%. Besides the sun hour data, there are other sources for irradiation data as well e.g. satellite. To calculate energy values, the dimension to be taken into consideration should be expressed in kWh/m² instead of sun hours. For a first energy yield analysis, the annual horizontal global irradiation was evaluated 1900.6 kWh/m² (Meteonorm data base).

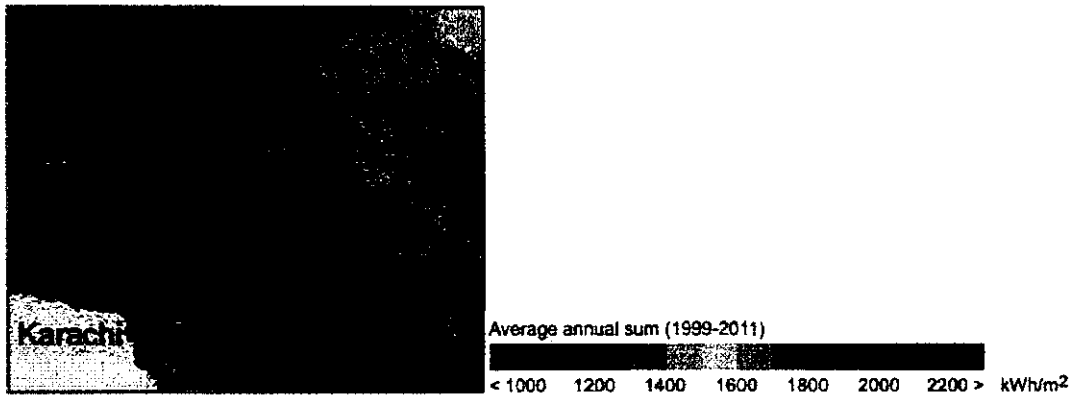

Figure 20: Global horizontal Irradiation (GHI) for Pakistan (Source: SolarGIS)

Table 6: Global horizontal Irradiance (Ghi) and Ambient Temperature (Ta) Monthly means (by Meteonorm 8)

Month	GlobHor (Ghi)	T Amb (Ta)
	kWh/m²	°C
January	122.6	15.7
February	130.8	19.1
March	176	25.3
April	188.8	30.1
May	204.2	34.4
June	190.5	34.3
July	162.5	33.2
August	153.5	31.6
September	165.3	30.5
October	157.3	28.7
November	129.7	22.5
December	119.4	17.3
Year	1900.6	26.9

Table 7 Global horizontal Irradiance (Ghi) and Ambient Temperature (Ta) (SolarGIS)

Month	GlobHor (Ghi)	T Amb (Ta)
	kWh/m²	°C
January	129	19
February	144	21.2
March	189	26.5
April	203	30.2
May	219	33.5
June	197	32.9
July	171	31.5
August	163	30.9
September	179	30.1
October	170	29.2
November	139	25.0
December	127	19.4
Year	2030	27.5

The deviation of single years from the long-term average can amount up to 15% and can show the same trend over several years. To minimize deviations for yield calculations, it is necessary to take into account a long term average of irradiation.

The figure below demonstrates the maximum deviation from the long term average in the years 1937-1999 at the Potsdam site. In fact, there will always be deviations in irradiance between each year of operation. Regarding the long term of operation these deviations will lead to an average irradiance very close to the number given in the yield analysis.

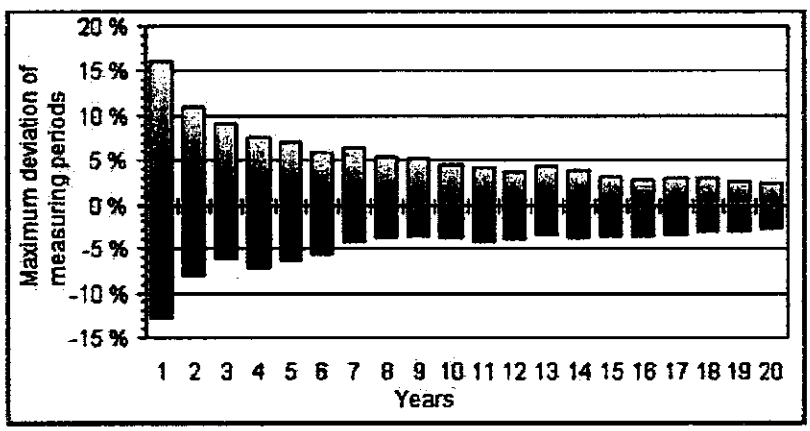

Figure 21 Deviation of Solar Irradiance from long term average

For the PV plant's geographical location, the uncertainty of irradiance measurement data is 3.1% (source: Meteonorm software, Version 7.3), as the nearest ground measurement station for comparative values is only available at a distance of 106 km.

6.2 Shading Analysis

From several site visits, we can summarize that terrain causes no relevant shading. There are a few existing settlements and vegetation, which will have to be relocated and removed before any construction begins.

6.3 Performance Ratio

A solar cell is the smallest semiconductor element within a PV module to perform the immediate conversion of sunlight into electrical energy by the photovoltaic effect. Depending on the employed technology, the degree of efficiency amounts up to 21 %. This value seems to be quite low but the free supply of primary energy (solar radiation) and the corresponding absence of power dissipation in the conventional sense should be taken into consideration. By using appropriate technology, the direct current generated by the solar modules is converted into alternating current that can be fed into the public power supply.

The conversion into alternating current implicates losses depends on the PV system configuration, the choice of components and to a minor degree on the local site conditions.

If these losses are identified and evaluated, the system operation quality – the performance ratio (PR) – can be ascertained.

The PR is stated as percentage and describes the relationship between the actual and theoretical energy outputs of the PV plant considering module efficiency.

PR = energy yield / (unshaded annual irradiation on array surface * module efficiency according to STC)

$$PR = 100 \times \left[\frac{E_{AC}}{E_{Irradiation} \times A_{Array} \times \eta_{STC}} \right]$$

E_{AC} = energy coming from the inverter or measured at the energy meter in kWh

$E_{Irradiation}$ = unshaded irradiation at module level in kWh

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A_{Array} = total surface of all solar modules in m²

η_{STC} = module efficiency at STC

The module efficiency (contrary to the cell efficiency) considers the gross module surface and can be calculated as follows:

$$\eta_{STC} = \left[\frac{P_{Module}}{A_{Module} \times 1.000}\right]$$

6.4 Expected Losses

A fundamental step in understanding this important quality criterion is the explanation of the typical loss factors affecting the energy yield with different weights. In every simulation step, all described aspects have an hourly impact on the overall result.

All technical losses described below are calculated in the energy yield analysis depending on system design and chosen components and operation conditions.

6.4.1 Irradiation Gain by Inclination of Modules

In non-equatorial zones, the degree of irradiation at module level can be improved by the inclination of modules southwards (northern hemisphere) or northwards (southern hemisphere) against the horizontal. When reaching a normal module inclination angle of 25 - 30 degrees, the irradiation gain can amount up to 10 – 15% in temperate zones. It is expressed by the surface-factor F (A) ~ 1.10 – 1.15.

6.4.2 Technical Losses because of Shading

If there are objects in the environment of the planned PV power plant causing shading of the solar generator. These shadings can be considered and simulated by a shading analysis. A distinction is made between "horizon shading" and "nearby shading".

Horizon shading causes a shading effect which has a permanent impact on the entire generator field. The simulation considers this effect by adjusting the horizon line. Objects that are in a large distance to the modules, e.g. mountain ranges, are typical horizon shadings.

Nearby shading has a temporary impact only on some parts of the generator field. Most parts of the site remain unaffected. Objects at close distance to the PV modules cast shadows, e.g. power poles, trees also there can be shading between different rows of PV modules. Greater distances between the mounting rows will lead to less nearby shading, as the effect of shading at low sun-angle will reduce.

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Depending on the site conditions, these aspects are considered in the yield simulation.

Best in class shading losses would be represented by values in the range of up to 1%. Acceptable values would range between 1% up to 4% always depending on the required use of ground and intended energy yield of the PV plant. Shading above 4% would be unacceptable.

6.4.3 Technical Losses because of Soiling

Dirt on the modules also causes shading effects which can change over time and seasonally. This shading impact on the energy yield depends for example on the surrounding landscape, cultivation and precipitation. The impact can only be appraised and is based on experience values as well as contracted cleaning. Consequently, the uncertainty is high. It is recommended to clean the PV modules regularly and based on an ongoing assessment of the actual soiling during operation.

Best in class soiling losses would be represented by values in the range of up to 2%. In Pakistan, acceptable values would range between 1% up to 5%. Soiling above 5% would be unacceptable.

6.4.4 Technical Losses because of Temperature Fluctuation

Ambient temperature and level of irradiation have an influence on the cell temperature and so affect the energy conversion process. According to the defined STC value of 25°C the electrical power output decreases with higher module cell temperature and increases with lower cell temperature. The PV module model shows this characteristic by means of temperature coefficients for current and voltage.

Best in class losses due to ambient temperature would be represented by values in the range of up to 9 % under the site conditions. Acceptable values would range between 9 % up to 11 %. Temperature fluctuation losses above 11 % would be un-acceptable.

6.4.5 Technical Losses because of Reflection

In particular inclined irradiation causes reflection of sunlight at the glass and solar cell surface. Although this causes a small effect, it is considered by an empirically determined factor: IAM (Incidence Angle Modifier). By default, the factor is set to 0.05.

Best in class losses due to reflection would be represented by values in the range of up to 1.5 %. Acceptable values would range between 1.5 % up to 2.8 %. Reflection losses above 2.8 % would be un-acceptable.

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6.4.6 Technical Losses because of low Irradiance Level

The irradiance varies over time (hourly and seasonally). The efficiency of the conversion of irradiance into electricity (expressed as efficiency the PV modules) is – due to manufacturing processes generally not identical for the entire width of irradiance levels. The PV module model shows this characteristic by means of different efficiencies for different irradiance levels.

Best in class losses due to this effect would be <0.2%. Acceptable values would range between 0.2 % up to 0.8 %.

6.4.7 Technical Losses because of Module Quality

Due to production related reasons and/or contractually allowed tolerances, the PV module output power under Standard Test Conditions might deviate.

Typical losses due to PV module quality are nowadays negative as only positive STC power tolerances are allowed.

Best in class losses due to module quality would be represented by values in the range of up to -1.0 %. Acceptable values would be negative as only positive tolerances are allowed.

6.4.8 Technical Losses because of Array Mismatch

Array mismatch losses are mainly caused by the fact that in a string of modules the lowest current drives the current of the whole string. With its statistically distributed parameters of current, voltage and power in each module, most of the modules will not be driven at their optimum operating conditions.

Best in class losses due to mismatch would be represented by values in the range of up to 0.5%. Acceptable values would range between 0.5% up to 1.5%. Mismatching losses above 1.5% would be unacceptable.

6.4.9 Technical Cable Losses

The whole wiring of the solar power plant is subjected to cable losses due to the natural resistance of conductors - the ohmic resistance. Due to small-scaled plant design and cable dimensioning for maximum performance, losses normally amount to 1 - 2%.

Best in class ohmic losses would be represented by values in the range of up to 1.5%. Acceptable values would range between 1.5% up to 2.5%. Ohmic losses above 2.5% would be unacceptable.

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6.4.10 Technical Losses because of DC to AC Inversion

The conversion of direct current (DC) into grid compatible alternating current (AC) entails inevitable losses. The inverter model shows this characteristic by means of different efficiencies for different load levels and input voltages.

Best in class losses due to DC/AC inversion would be represented by values in range of up to 1.0%. Acceptable values would range between 1.0% up to 2%. DC/AC inversion losses above 2% would be unacceptable.

6.4.11 Technical Losses because of Transformation (Transformer Losses)

Transformer losses depend simultaneously on several parameters. Basic technical parameters like ohmic and magnetic resistance can be taken into consideration.

Best in class losses due to voltage transformation would be represented by values in range of up to 0.6%. Acceptable values would range between 0.6% up to 1.2%. Transformation losses above 1.2% would be unacceptable.

6.4.12 Technical Losses because of Self-Consumption

Inverters (operation, fans, heating ...), monitoring and security systems as well as communication systems consume power. During energy production the necessary power is reducing the current output of the PV plant.

Best in class self-consumption losses would be represented by values in the range of up to 0.2 %. Acceptable values would range between 0.2 % up to 0.5 %. Self-consumption losses above 0.5 % would be not acceptable.

6.4.13 Technical Losses because of Plant-Availability

The technical availability of a PV plant crucially determines the energy yield. Outages due to failure of fuses, disconnected strings or broken inverters are likely to occur and therefore must be considered in the expected energy yield.

Best in class technical availability losses would be represented by values in range of up to 0.3%. Acceptable values would range between 0.3% up to 1.2%. Availability losses above 1.2% would be unacceptable.

6.4.14 Technical losses because of Light-Induced Degradation (LID)

Light-Induced Degradation or sometimes referred to as initial degradation is a potential slight performance drop of the PV modules during the initial hours and days when exposed to solar irradiance which can affect several solar cells. Manufacturers of crystalline modules do not always take into account the potential LID effects when drafting the STC power specifications on the nameplate. If a manufacturer fails to take the

KAD

LID into account during the power classification of the PV modules, this value will be used to regard this effect within the simulation.

Best in class LID losses would be represented by values in the range of up to 1.0 %. Acceptable values would range between 1.0 % up to 2.5 %. LID losses above 2.5 % would be not acceptable.

6.4.15Technical Losses because of Weathering and Degradation

Changes in the energy yield because of weathering need to be considered in the expected long term energy yield. As degradation of the PV modules is a continuous process, depending on time, performance will decrease over time of operation. Performance guarantees of the manufacturer and different practical results diverge a lot. Former long-term study findings cannot be applied easily to PV modules produced with today's manufacturing processes and product features. But it is assumed that today's processes and technologies lead to a higher module quality. The consideration of an annual correction value for weathering / degradation is recommended for the overall result.

Best in class degradation losses would be represented by values in the range of up to 0.1 %. Acceptable values would range between 0.1 % up to 0.5 %. Degradation losses above 0.5 % would be not acceptable.

6.5 Overview to Technical Losses

As the technical design is not decided yet, our calculations are based on typical assumptions and state of the art components. The abovementioned described losses come out of the yield calculations of a so called waterfall diagram. Table 8 summarizes values of loss-factors.

Table 8: Overview to Loss Factors and Quality Classification

Loss Factor	Best in Class	Non Acceptable
	%	%
Shading	< 1.0	> 4.0
Soiling	< 1.0	> 5.0
Low irradiance	< 0.2	> 0.8
Ambient temperature	< 9.0	> 11.0
Reflection	< 1.5	> 2.8
Module quality performance	< -1.0	> 0.0
Module mismatch losses	< 0.5	> 1.5
Cable losses	< 1.5	> 2.5
DC/AC conversion	< 1.0	> 2.0
Voltage transformation	< 0.6	> 1.2
Self-consumption	< 0.2	> 0.5
Availability	< 0.3	> 1.2
Light-Induced Degradation (LID)	< 1.0	> 2.5
Degradation on average	< 0.1	> 0.5

See below the results for single axis tracking [-60^0 to 60°] system.

General explanation of the waterfall diagram: (1) Starting with the Horizontal Global Irradiance: the tracking installation increases the irradiance on PV module plane. Near shadings, soiling losses and glass reflections reduce that gain. (2) Once the irradiance

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reaches the active cell, it is converted to electric power ("PV conversion"). (3) Further, electrical losses occur in the electrical system depending on the characteristic behavior of the components used, cabling design, and operation of the equipment. Performance ratio of the whole system is calculated between "Energy injected to grid" and "Array nominal energy (at STC efficiency)".

Four simulations have been run for a single axis tracking system [-60^0 to 60°]. Two on Meteonorm with using Mono-Perc and Bifacial modules and another two on SolarGIS using the same technologies. For Reference one loss diagram using Meteonorm as the irradiance source and Mono-Perc modules is shown in Figure 22. The losses are in the expected range for the design and environmental conditions and have been kept same in all simulations. All PVsyst simulations are attached as Appendix 1.

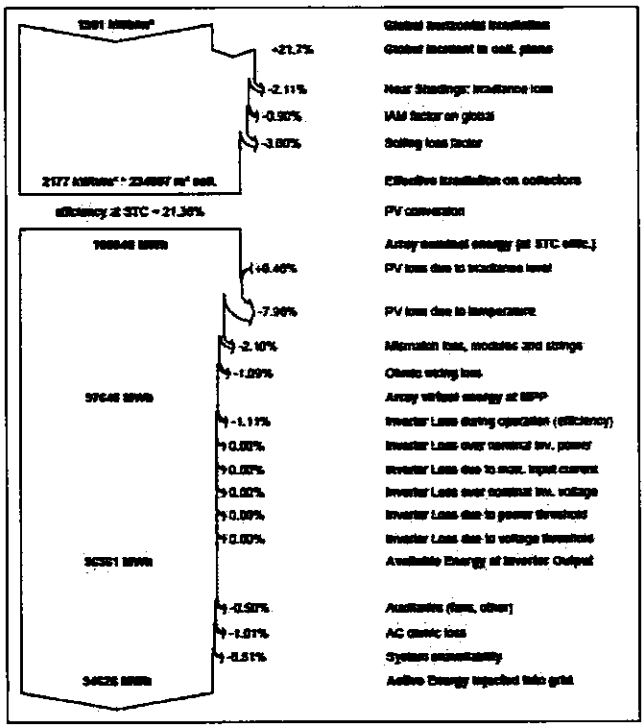

Figure 22 Loss Diagram on Meteornorm with Mono-Perc Modules

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6.6 Energy Yield Simulation for most suitable Technical Design

Different pre-assessments have been calculated with the simulation software PVSyst. PVSyst takes as an input, the meteorological data as well as a given system design and a component selection. Then it simulates a whole operational year in two-minutes-steps through a whole year.

The options for technical design are single axis tracking with minimum tilt of -60 to a maximum tilt of 60. The first high level yield assessments show following initial annual output to grid at P50 level. The results (see) are calculated for the interconnection point with the HV grid.

The results include cable losses to the point of interconnection to the HV Power line.

Table 9: Summarized Main Results of Yield Simulation (Please see plot of main results in Appendix 1)

Feature				
Irradiation in module plane [kWh/m²/year]	1900.6	1900.6	2029.6	2029.6
Performance Ratio (PR) [%]	81.82	85.70	81.07	85
Initial specific output [kWh/kWp]	1892	1982	1984	2080
Total output for 50 MWp [MWh/year]	94,626	99,119	99,182	103,985

6.6.1 Risk Mitigation

All the risks on the energy output can be controlled, except for the meteorological uncertainties. We strongly recommend to contractually specifying each qualitative relevant detail in the EPC and O&M contract. This includes the quality criteria, how they are to be measured for the single PV plants and the consequence if they are not met.

This point is most valid for the PV modules and inverters. To enforce the deliverables, a financial security should be in place for a minimum of two years, preferably five years.

The meteorological uncertainties have to be considered in the financial model, which needs to have the flexibility to cater for those.

APPENDIX 1: PVSyst Simulation

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APPENDIX 2: Geotechnical Investigation Report

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APPENDIX 3: Meteorological Report

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APPENDIX 4: Initial Environmental Examination

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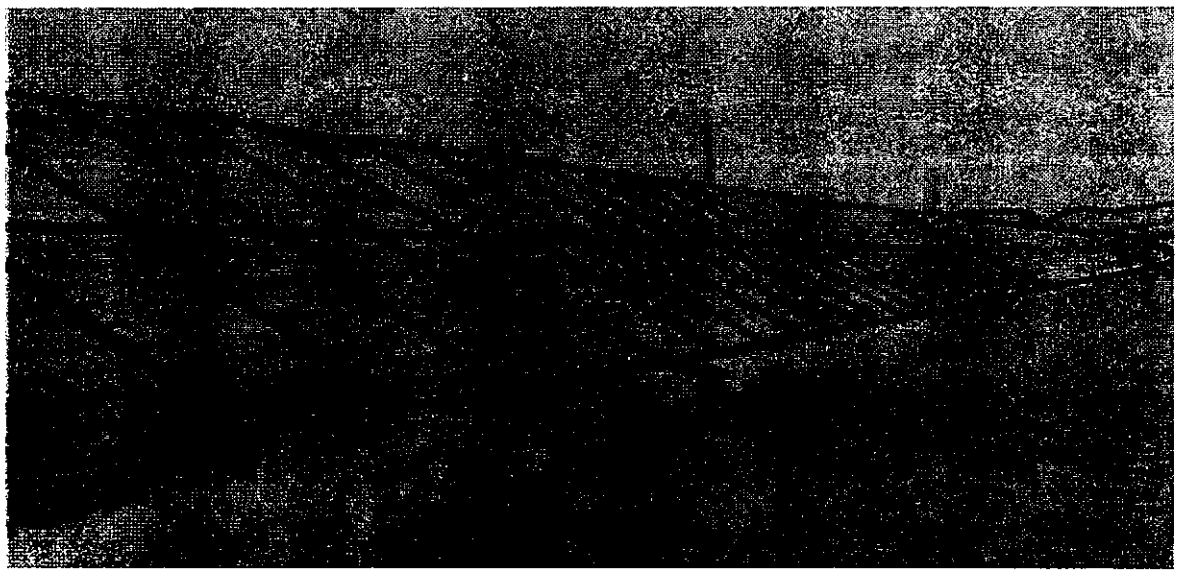

Feasibility Study

Type of Report:	Feasibility Study
Project:	Feasibility Study of Bela Extension
Client:	K-Electric Limited
Purpose:	Assessment of the technical viability of a 50 MWp solar PV project at Bela, Pakistan
Site location, Country:	Bela (26° 8'0.46"N, 66°25'55.81"E), Pakistan
Operator:	K-Electric Limited
Report number:	202624-2-Bela- Extension-FS-R00
Date of Inspection:	02-01-2024

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RAO

Table of Contents

List of Tables

RAO

List of Figures

Revision

Version	Modifications
First	R00

RAD

I. Confidential and Proprietary Content

8.2 Renewable Energy Experts Hamburg GmbH (named hereinafter: "8.2 Renewable Energy Experts Hamburg") has been commissioned by the client to prepare the following report (the "report"). The report summarizes the findings obtained during on-site visit(s) and/or through the assessment of project related documents which have been provided by the client. The report is confidential and proprietary and has been prepared exclusively for the benefit of the client. The report may solely be used for the intended purpose by the client and his or her professional advisors who are bound by confidentiality obligations. The report shall not inform or protect any third party. It shall not be used by any third party or for any other purpose. The client shall not disclose, publish, copy or otherwise reveal any of the confidential information embodied in the report to any third party without the prior written consent of 8.2 Renewable Energy Experts Hamburg.

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8.) In the case of information and documents having been provided by the client in languages other than English or German, the assessment of 8.2 Renewable Energy Experts Hamburg has been limited to a plausibility check without detailed analysis and detailed evaluation of such information and documents.

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List of Abbreviations:

a	Year
A	Ampere
AC	Alternating Current
AJB	Array Junction Box (string combiner at structure table)
CE	Conformité Européenne
DC	Direct Current
GJB	Generator Junction Box (main combiner before inverter)
EBB	Equipotential Bus Bar
EN	European Standard
EL	Electroluminescence
F(A)	Surface factor (Flächenfaktor), indicates the value by which the annual global irradiation at module level changes (depending on inclination and alignment of the generator)
GaSC	Ground and short-circuit
GB Standards	Guobiao Standards
Gh [kWh / m^2 a]	Global irradiation [kilowatt hour per square metre and year]
GJB	Generator Junction Box
h	Hour
HV	High Voltage (44kV and higher)
I	Electric Current
IAM	Incidence Angle Modifier (adjustment value inclined irradiation)
IEC	International Electrotechnical Commission
INV	Inverter; converts the direct current from the solar generator into grid-compatible alternating current.
INVS1	Inverter statiion 1
ISFH	Institut für Solarenergieforschung Hameln (Institute for Solar Energy Research Hameln)
ISO	International Organization for Standardization

kV	Kilovolt
kVA / MVA	Kilovolt-ampere / Megavolt-ampere
kW	Kilowatt
kWh	Kilowatt hour
kWp	Kilowatt peak
LCOE	Levelized cost of Energy
LV	Low Voltage
MPP	Maximum Power Point (point of maximum power = operating point of module, string or even entire solar generator)
MPP-Tracker	Electrotechnical tracking system assuring the optimal operating point
MV	Medium Voltage
MWp	Megawatt peak
NOCT	Nominal Operation Cell Temperature (practical operating conditions); irradiance on cell surface 800 W/m²; air temperature 20°Celsius; wind velocity 1 m/s
O&M	Operations and Maintenance
PE	Potential Equalization
POA	Plane of Array
PPA	Power Purchase Agreement
PR	Performance Ratio
PV	Photovoltaic
PV-Module / Module	Single solar module; smallest, essentially planar assembly of solar cells and ancillary parts, such as interconnections and terminals intended to generate direct current power
Solar generator	Total of all PV strings of a PV power supply system which are electrically interconnected
STC	Standard Test Conditions Irradiance at module level 1,000 W/m² Cell junction temperature 25°C Solar spectral irradiance distribution AM 1.5 (AM = Air Mass)

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String / Module string	Consists of 23 PV modules connected in series and is the smallest site assembled power unit
TA	Technical Advisor
TC	Technical Consultant
TF station	Transfer station; interface to the power utility with electricity meter for billing purposes
TS	Transformer station; transforms the alternating current from LV to MV
V	Voltage
UPS	Uninterrupted Power Supply
Wp	Watt peak, rated power output or peak power at STC is the output data for solar modules or solar plants
IEE	Initial Environment Examination

General Data

Assignment

Task:	Preparation of a Feasibility Study
Scope of Work:	8.2 REEP was commissioned to perform a feasibility study to evaluate the viability and potential of the site as part of the contract.
Client:	K-Electric Limited KE House, 39-B, Sunset Boulevard, DHA Phase II Karachi Pakistan
Order Date:	28-12-2023
Contractor:	8.2 Renewable Energy Experts Pakistan 60-H, Gulberg III Lahore, Pakistan
Author / Inspector:	Abrar Ali
Second Inspector:	Muhammad Ali Javaid
Report number:	202624-2-Bela- Extension-FS-R00

RAO

Project Identification

Solar plant	50MWp K-Electric Plant at Bela
Coordinates (Lat, Lon)	26° 8'0.46"N, 66°25'55.81"E
Location, Country	Bela, Pakistan
Altitude above sea level	83 m
Plant type	ground mounted
Size of the site	approx. 1.0 km² (237 acres)
Expected plant size	50,000 kWp
Grid connection	High Voltage Level,132 kV substation
Electric utility company	K-Electric Limited
General Contractor	to be selected
Project Developer	K-Electric Limited
Site Owner	K-Electric Limited
Road Access	Site is located on main Regional Cooperation for Development (RCD) Highway
Water Access	No proper water access, tube wells with RO plants are recommended

Executive Summary

This feasibility study provides a thorough evaluation for the proposed extension of a 50 MWp Photovoltaic (PV) Power Plant in the designated site of Bela, Balochistan, Pakistan. The aim is to add an extra 50 MWp, thereby achieving a cumulative capacity of 100 MWp. A site has been allocated for the potential establishment of a 50 MWp PV Power Plant in Bela and its feasibility study has already been carried out.

Building on the success and feasibility of the initial 50 MWp Bela project, the extension benefits from the extensive knowledge and experience gained over the years, demonstrating the ability to develop highly efficient solar parks irrespective of size. Analysis of data sourced from various studies, including Geo-Tech and IEE, affirms the continued feasibility of the site for the expanded power plant. Currently available market components are deemed suitable for the environmental conditions of the region.

While the feasibility study addresses project risks, a continuous risk management plan is recommended to ensure smooth project execution. A project timeline of 12 months from financial close until commercial operation is assumed.

The recommendation for a single-axis mounting structure is reiterated for the extension, as it offers an optimal balance between increased yield and capacity factor with minimal cost impact. Technological advancements now make tracking systems a viable and preferable option compared to fixed mounting structures.

The additional 50 MWp enhances the cumulative capacity to 100 MWp, aligning with the government's commitment to sustainable energy development. The project's viability, coupled with advancements in technology and governmental support, positions it as a strategic contributor to Pakistan's growing renewable energy landscape.

Lahore, 22.01.2024

Abrar Ali MSc. (Eng.)

Muhammad Ali Javaid, BSc. (Eng.)

Summary

This feasibility study assesses and summarizes the given information and includes additional results from extensive site visits.

Geographical Description

The plant site is located in Bela which lies in the Lasbela district of Balochistan. The plant is an extension of bela with the size of 50,000 kWp which will cover an approximate area of 237 acres. The location of the plant is shown in Figure 1. Installations in this phase shall be connected to the 132 kV overhead power line. Presently, there is an existing 66kV transmission line which will be dismantled and a new 132kV line would be set up.

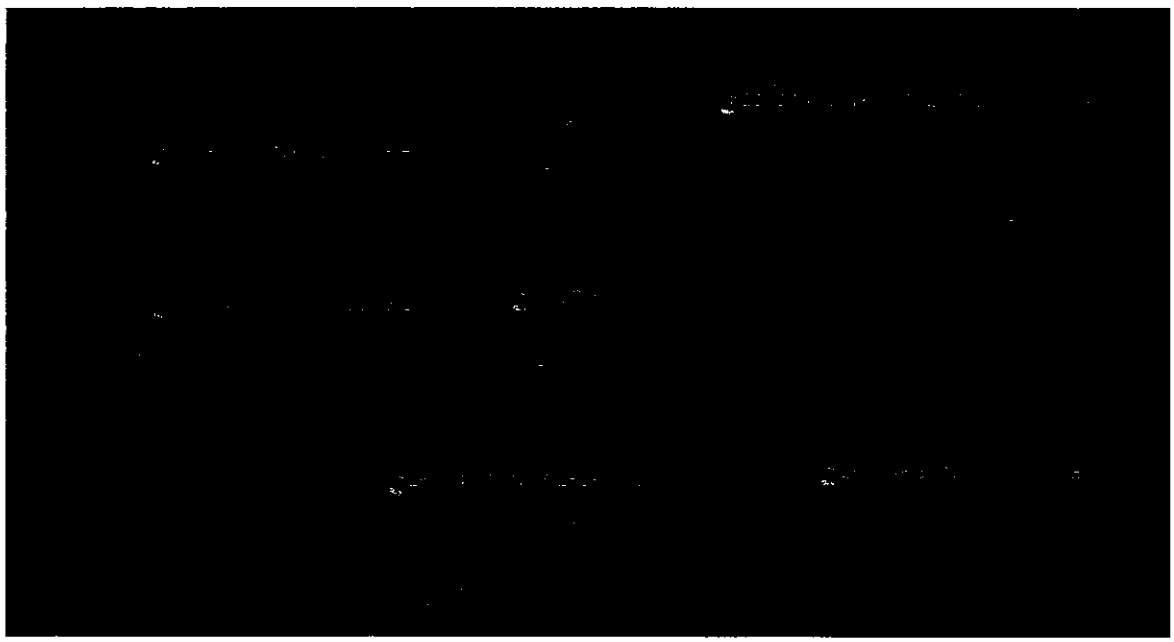

Figure 1: Location of Site

Project Status

The project is under RFP stage i.e. the RFPs have been floated for the Bidders. Moreover, various studies like the Initial Environment Examination, Geo-Tech, topography and meteorological study have been conducted for the plant site. K-Electric plans to begin the construction of the power plant soon after approval from concerned authorities.

8.2 Technical Risk Factors for the Bela Power Plant

The following table shows the possible risks and their assumed occurrence probabilities associated with the project.

Deal Breaker: high risk not possible to solve	
High Risk, possible to solve	
Medium Risk, possible to solve	
Low Risk, possible to solve	
OK	

Sr.-No	Subject	Risk	Impact of Risk	Risk Value	Risk Mitigation
1	Geographic parameters	The exact position for power plant has been finalized. However, there is unwanted vegetation.	Unwanted vegetation at the location may reduce sunlight exposure, impacting energy efficiency and overall performance.	Low Risk	Relocation or removal of vegetation has to be considered.
2	Climatic conditions	The climate conditions require robust components. Amongst other criteria, effective cooling, dust/sand filters and abrasive resistant materials shall be utilized. Bela extension (altitude 98.25 m) is higher than Bela 1 (altitude 83.25 m) thereby reducing the flood risk.	Failure to implement effective cooling, dust/sand filters, and abrasion-resistant materials would affect the longevity of components and performance of Solar Power Plant.	Low Risk	To be considered in detailed design
3	Environmental Aspects	Precautions against rodents shall be made to protect cabling effectively.	Inadequate precautions against rodents pose a risk to solar power plant cabling integrity, potentially leading to disruptions in energy	Low Risk	To be considered in detailed design

Sr.-No	Subject	Risk	Impact of Risk	Risk Value	Risk Mitigation
			production and system reliability.		
4	Topography and grounding	Foundations for Buildings have to be well prepared. Screw- or Ramming-Pile foundations present the best options for installation of PV-generator. The overall design, selection of components, and all constructions and foundations, as well as cabling have to be suitable for these conditions.	Unsuitable foundations and installation methods can undermine the stability and performance of the solar power plant, necessitating careful design and component selection to address topography and grounding concerns.	Low Risk	Soil analysis has to be considered for foundation design.
5	Irradiation Data	There is a potential bias of satellite irradiance data for this area by 3-5% towards the downside of the expected value.	A potential 3-5% bias in satellite irradiance data may lead to underestimated energy production, impacting the overall performance of the solar power plant.	Low Risk	Ground measurements for at least 6 months should be done before financial close to reduce the uncertainty
6	Transport Access	The accessibility to the PV development area has been established via RCD highway. Construction and service roads within the Plant's area have to be erected.	-	Low Risk	To be done during detailed design
7	Water Access	A water management plan for construction and operation of the plant shall to be carried out.	Insufficient implementation of a water management plan poses a risk to construction and operational activities.	Low Risk	To be done during detailed design

Sr.-No	Subject	Risk	Impact of Risk	Risk Value	Risk Mitigation
8	Grid Access	Currently, there is no available line to get electricity during construction phase. Therefore, a MV power line should be made or diesel generators should be used to provide electricity during construction phase.	Due to the limited grid access, a dedicated MV power line or reliance on diesel generators during construction is required, not having so will potentially impact solar power plant timelines.	Low Risk	MV Power Line should be made or diesel generators should be used. Erection of MV/HV step-up stations to be considered during planning phase.
9	Facility Access	Access to public facilities (fire / police station, hospital) is well available nearby. Fire hydrants have to be established along the roadside in a distance of max. 120 m.	In case of absence of fire hydrants potential risks associated in cause of outbreak of fire increases.	Low Risk	To be initiated
10	Grid connection	The specific requirements and approval for grid connection need to be confirmed by NEPRA / KE	Delays would affect the timelines of the Project.	Low Risk	To be initiated asap

3 Overview of Solar Photovoltaic Plants and Related Technologies

3.1 Basic Principles of Solar Photovoltaic Plants

Solar photovoltaic plants use the global irradiation (GI), which is converted into electric energy. Adequate project locations should offer at least 1,200 kWh/m² per year. The basic concept of a PV power plant is shown in Figure 2 below.

The solar energy collected by the modules is aggregated in several steps until it reaches the inverter. The inverter converts the DC power provided by the modules into AC power to feed into the grid.

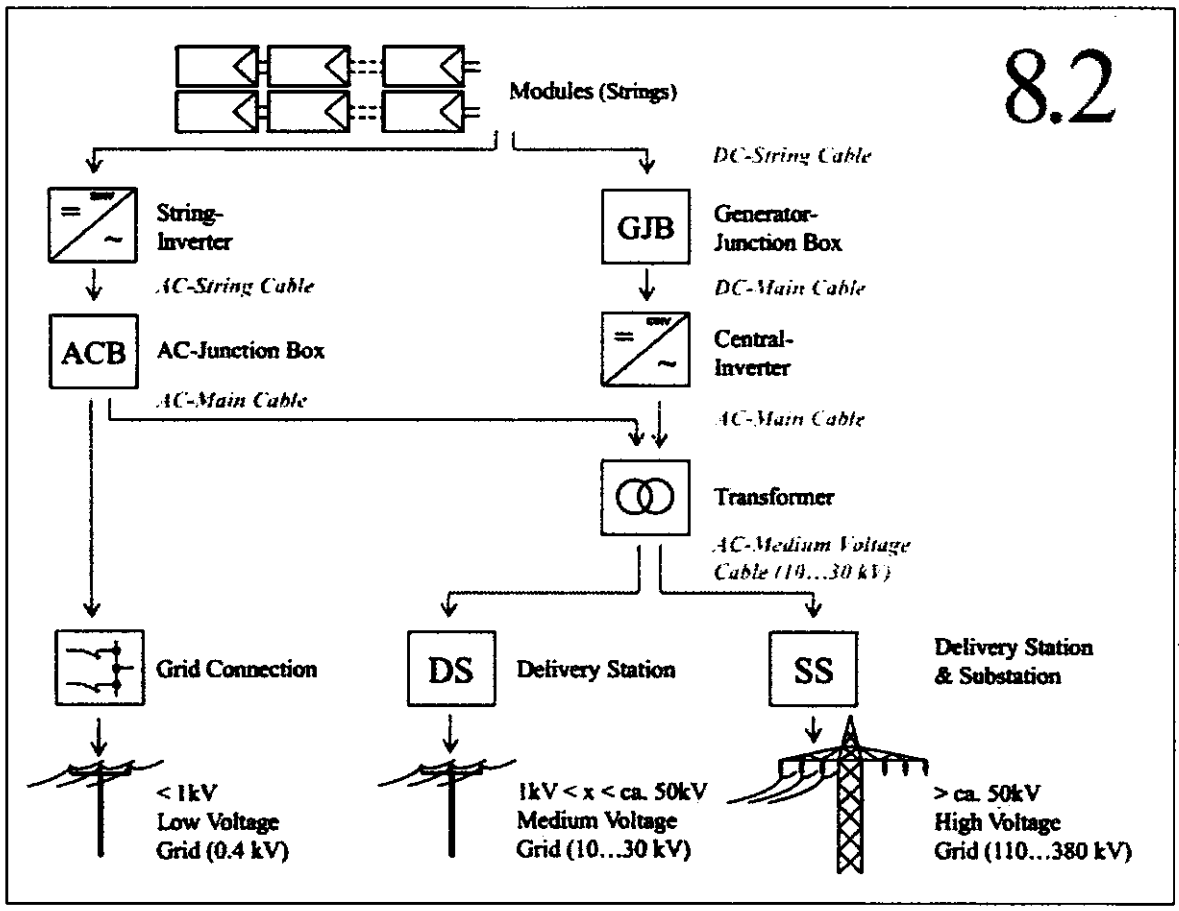

Figure 2 Schematic Overview / Principle of Photovoltaic Systems, Single Line Diagram

3.1 Basic principles of photovoltaic modules

Photovoltaic technologies differ primarily by the type of manufacturing process, which leads to different price ranges, manufacturing cost and performance for the different technologies. Photovoltaic technology is based on the photoelectric effect, in which the photons emitted by the sun get converted to electric power by the semiconductor. The semiconductor is typically made of silicon (80% of the global market).

These absorbed photons hit the atoms, releasing electrons, which causes a chain reaction that multiplies the effect of electrons released. The electrons get lifted from a lower potential to higher. This increase in potential results in the generation of current through potential difference (voltage). The reactions and release of electrons is continuous.

The purity level of the conductor material is important as well as the fact that there are no gaps or defects at the molecular and atomic level of the semiconductor material. As a general rule, the lesser the microscopic defects, the higher the efficiency of power conversion.

The efficiency of a solar cell (η) is the percentage of power from solar energy, incident on the panel, converted to electrical energy. This term is calculated using the ratio of the maximum power point of the cell, Pm, divided by the light power that reaches the cell, the global irradiance (E, in W / m^2) and the surface area of the solar cell (Ac in m^2).

$$\eta = \frac{Pm}{E \; x \; Ac}$$

As this efficiency varies in different irradiance conditions, the PV industry defined certain conditions for efficiency rating of PV panels. These are called standard test conditions (STC).

Another important standardized variable is the Normal Operating Cell Temperature (NOCT) for modules. This is a characteristic cell value defined as the temperature of the cells, which they reach at an irradiance of 800 W / m^2, an ambient temperature of 20°C and a wind speed of 1 m / s – typically given at open circuit.

Three main solar cell technologies are commercially available:

- Monocrystalline
- Polycrystalline
- Thin Film

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3.3.1 Monocrystalline technology

The manufacturing process of monocrystalline cells requires more effort in comparison to other technologies. However, these cells offer higher efficiency – typically within 15 – 21 %.

Advantages:

- The loss of efficiency due to the higher temperature is lower than for other types of crystalline module technologies.
- Mature and commercially proven technology.
- Long life of panels.
- Low degradation of maximum 0.1 - 0.5 % per year (manufacturer guarantee is 0.7 % degradation per year; however reality proves to be less).
- Lower installation costs.
- More environmentally friendly than other technologies, for example, some thin film technologies use cadmium. Monocrystalline cells are not harmful to the environment.

Disadvantages:

- The initial investment costs are higher.
- Higher risk of damages (micro-cracks) during transport or during operation at sites with high wind speeds.

3.3.2 Polycrystalline technology

This technology exists since 1981. The manufacturing process is simpler when compared with monocrystalline technology.

Advantages:

- Lower production costs.

Disadvantages:

- Lower efficiency, due to lower purity of the cell material: 14 – 16 % (module size)
- Because of the lower efficiency, slightly more ground surface area is required to reach the same capacity (as for monocrystalline).
- Higher risk of damages (micro cracks) during transport or during operation at sites with high wind speeds.

Thin Film Technology

This technology is called Thin Film because only a couple nanometers of the semiconductor material is placed on a substrate material. Hence a very low amount of material is needed. The main semiconductor materials used are:

- Cadmium Telluride (CdTe)
- Copper Iridium Gallium Selenium (CIS / CIGS)

Thin Film technologies have a low market share, except of the CdTe material, with the main manufacturer First Solar. But also CIS / CIGS technologies are having an increasing market, because of their higher efficiency. Depending on the technology, standard thin film module efficiencies have reached 7 - 15%. Prototypes of these technologies reach an efficiency of 16% and more which is expected to be transformed to standard products in the future.

Advantages:

- Easier to manufacture, thus lower costs.
- Homogenous appearance.
- Flexible, hence for use at different applications and surfaces.
- Less affected by high temperatures and shadowing.

Disadvantages:

- Faster degradation rate of up to 0.7 % per year. However, there are some hints that, nowadays, CIS has degradation rates comparable to crystalline modules.
- Lower efficiency leads to greater surface area requirements, for the same capacity.

Table 1: Comparison of the Module Technologies

		Crystalline		Thin Film	
	Parameter	Monocrystalline	Polycrystalline	CdTe	CIS / CIGS
1	Voltage rating -V_{mp} and V_{oc}	80 % – 85 %	80 % – 85 %	72 % - 78 %	72 % - 78 %
2	Temperature Coefficient	Higher losses (ca. -0,4 %/K)	Higher losses (ca. -0,45 %/K)	Lower losses (ca. -0,2 %/K)	Higher losses (ca. -0.35 %/K)
2a	Performance Losses for 40°C ambient temperature (~ 60°C	~ 14 %	~ 15.75%	~ 7%	~ 12.25%

		Crystalline		Thin Film	
	Parameter	Monocrystalline	Polycrystalline	CdTe	CIS / CIGS
	cell temperature) versus STC conditions (25°C cell temperature)				
3	I-V curve Fill Factor	Higher 70 % - 85 %	Higher 70 % - 85 %	Lower 60 % - 72 %	Higher 70 % - 85 %
4	Module Construction	Framed with structural or anodized aluminium	Framed with structural or anodized aluminium	Normally Frameless	Normally Frameless
5	Module Efficiency	14 % - 20 %	12 % - 17 %	6 % - 12 %	13 % - 15 %
6	Inverter Compatibility and Sizing	High efficiency → less modules → less inverters	High efficiency → less modules → less inverters	Low efficiency → more modules → more inverters	High efficiency →less modules → less inverters
7	Mounting System	Industry Standard practices	Industry Standard practices	Special clips and structures for frameless modules may be needed to hold the module. Mounting system has to be accepted by module manufacturer.	Special clips and structures for frameless modules may be needed to hold the module. Mounting system has to be accepted by module manufacturer.
9	Layout Area	Much smaller size for the same output.	Smaller size for the same output.	May require up to 50% more space for the given project size. The extra space can't be standardized and depends on the design (rows over each other) and the site conditions.	Smaller size for the same output.

		Crystalline		Thin Film	
	Parameter	Monocrystalline	Polycrystalline	CdTe	CIS / CIGS
10	Applications	On grid and off grid usage. More usual as a reference cell and used for scientific tests.	On grid and off grid usage.	On grid and off grid usage.	On grid and off grid usage.
11	PV Plant cell cost	More expensive than polycrystalline and CdTe modules due to high cell efficiency	Cost Higher than CdTe due to higher cell efficiency; Production process easier which lowers the basic cost	Cost Lower due to lower efficiency and double pane glass sheeting	Very expensive
12	PV Plant module unit cost	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses	Cost per kWh comparable	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses	Cost per kWp slightly higher as for polycrystalline modules, but comparable to the cost per kWh due to fewer losses
13	PV Plant total cost	Lower Cost due to higher efficiency of the modules (less modules and less mounting structures). Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	Usually lowest cost (Low m^2 cost and less m^2 needed because of the higher efficiency compared to thin film modules). Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	Highest cost due to additional space and mounting structures needed. Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)	High cost due to additional space and mounting structures needed. Entire cost depends on the market situation (module price) and the concerned country (m^2 cost)
14	Module power output	Immediate and stable; but zero shadow tolerance, high losses when temperature high and irradiation suboptimal	Immediate and stable; but zero shadow tolerance, high losses when temperature is high and irradiation suboptimal	Requires time to stabilize power output; even slightly shadowed output is feasible	Very good weak light performance (best results of the technologies in winter)
15	Degradation	Around 0.5 % per year	Around 0.5 % per year	Around 0.5 % per year	Around 0.2 % per year

RAM

		Crystalline		Thin Film	
	Parameter	Monocrystalline	Polycrystalline	CdTe	CIS / CIGS
16	Market perspective	Standard technology many providers.	Standard technology, many providers	One big provider (First solar)	Little number of providers.

3.2 Mounting structures and tracking systems

The photovoltaic modules can be installed on fixed structures or on moving structures tracking the sun. Trackers can be implemented either as a single axis system or as a dual axis tracking system.

3.2.1 Fixed mounted structure

Fixed structures are usually tilted to face south (north in southern hemisphere) with a fixed angle depending on several parameters e.g. the location. Nowadays, more and more PV power plants are installed with modules tilted to east and west usually with tilt angles between 10° to 15°. This installation type would offer lower peak capacity. However, the generation curve would be less spiked and allow an energy generation distribution to be more spread out over the day. The row shading of these installations is less, such that the rows can be installed closer to each other and more modules can be installed on the same area as it is possible with modules facing south. Depending on the construction, the installation costs of east-west installations are often lower than south oriented systems.

Figure 3 Fixed Mounted Structure facing south or north

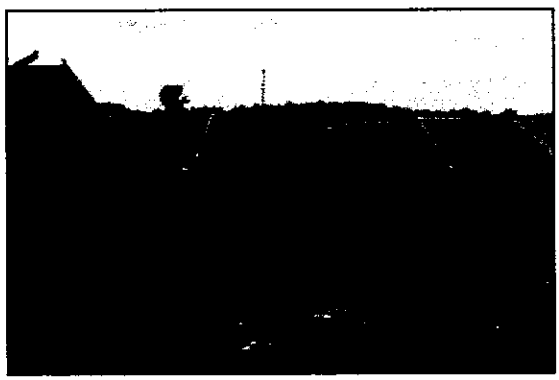


Figure 4 Fixed Mounted Structure facing east and west

Tracker systems

The aim of trackers is an optimized adjustment of the module surface to the sun during the day to increase the total irradiation onto the module surface. This can also lead to greater efficiency in converting solar energy. Commonly used tracking systems are single and dual-axis trackers.

Dual-axis trackers follow the sun in azimuth and tilt. With it, the sun can be exactly tracked over the course of the day to achieve an optimized irradiation angle. Dual-axis trackers have one pole which is carrying and tracking a frame with modules mounted on. Usually, between 20 and 30 modules are installed on one tracker. The installed module capacity on the plant has to be lower than with fixed mounted structures to avoid overwhelming shading losses. Dual-axis trackers are almost independent of the landscape.

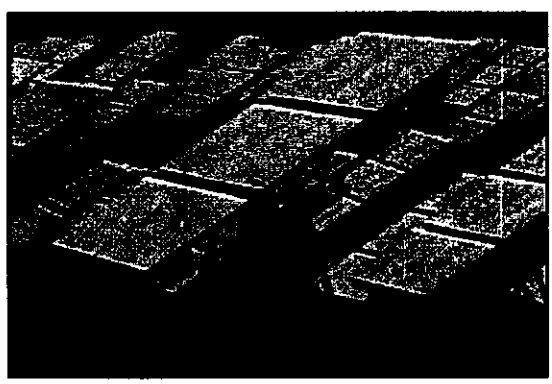


Figure 5 Dual-Axis Tracker

Single-axis trackers usually follow the azimuth of the sun. Several construction types exist. One is similar to dual axis trackers with one pole carrying a module frame (vertical axis system). In that case, the module tilt is fixed and the pole is used as rotation axis. The tilt depends on the location. For the location Bela (26° 8'0.46"N, 66°25'55.81"E) the optimal installation would have a tilt of approximately 28°.

Because the single-axis tracker, described above, needs similar space as dual axis trackers, nowadays another type of single axis tracker is in use. This one has a horizontal rotation axis oriented from south to north or from east to west. The modules are installed parallel to the rotation axis. Depending on the way of installation and length of horizontal axis the requirements to the flatness of the area can be higher, because the horizontal axis itself is not able to compensate irregularities.

RAP

Figure 6 Single Axis Tracker, vertical Axis

Figure 7 Single Axis Tracker, horizontal Axis

The decision to choose any of the three types of mounting structure is based on a technical and economical evaluation. When choosing a tracking system, the extra energy generation in combination with the energy price must be compared with the additional investment and maintenance costs required for tracking systems.

In general, tracker solutions gather more irradiation per installed module capacity than fixed mounted modules. The peak of the production curve is wider during the day compared to fixed mounted modules. But the installation effort is higher for tracker solutions based on their design. More attention has to be laid into the resistance against heavy storms.

Table 2: Comparison of the Mounting Systems

	Parameter	Fixed-tilted		Horizontal single-axis tracker		Vertical single-axis tracker	Dual-axis tracker
		South faced	East-west	East-west	North-south		
1	System costs	Lower than for tracker solutions, as no mechanical parts		Higher costs than fixed-tilted. High differences between the manufacturers.		Higher costs than horizontal tracker	The highest costs of all systems
2	Installation costs	Lower than for tracker solutions, as less complex system. But the difference regarding the total installation cost is minimal compared to the horizontal tracker.		Higher costs than the fixed tilted system, but lower than the vertical tracker.		Higher installation costs, especially for the commissioning phase.	Higher installation costs, especially for the commissioning phase
3	Maintenance costs	Lower than for tracker solutions, as no mechanical parts		Depends on the selected manufacturer (options without mechanical parts available), but cost higher than fixed-tilted		Higher costs based on the mechanical parts	Higher costs based on the mechanical parts

	Parameter	Fixed-tilted		Horizontal single-axis tracker		Vertical single-axis tracker	Dual-axis tracker
		South faced	East-west	East-west	North-south		
4	Max. pivoting angle range	10° to 35°	5° to 20°	-120° to 120°	-120° to 120°	Fixed tilt for site 28°, vertical axis -180 to 180°	Motorized tilt 00-80° and vertical axis -180° to 180°
5	Site requirements	System is adaptable to uneven ground and high slopes. Standard system up to 35°(North/South) and 10°(East/West)		Ground might be uneven with slopes up to 28°	Ground might be uneven with slopes up to 28° The system makes just sense if the site is not facing South.	Ground might be uneven but sites with higher slopes are not suitable without huge extra effort	Ground might be uneven but sites with higher slopes are not suitable without huge extra effort
6	Space requirement	Several rows can be installed over each other. Space requirement low	No row shading, so the rows can be installed near to each other. Best space requirement	Installation of rows over each other is limited, but space requirement not much higher than fixed- tilted	Installation of rows over each other is limited, but space requirement not much higher than fixed- tilted	The distance between the trackers must be high. Space requirement is high	The distance between the trackers must be high. Space requirement is high
7	Space factor (Wp/m2)	~50 - 75	~60 - 90	~40 - 65~	~45 - 55	~15 - 25	~15 - 25

3.4 Inverter Technology

Because photovoltaic panels generate DC electricity, it must be converted to alternating current before it can be fed into the grid. This is achieved by an electronic device called inverter.

State of the art inverters offer a broad range of operational stages, which generally fulfill all the requirements of the international grid codes in terms of fault-ride-through and reactive power provision. Inverter stations provide a protective shell in which PV-strings can be connected to inverters. Centralized inverters typically have a capacity from 2000 kW to 8800 kW of DC PV-Power, depending on the size of inverter.

From the inverter stations the AC power is stepped-up by a MV or HV-Transformer, and then connected to a medium or high voltage grid (for instance 132 kV and 220 kV as in Pakistan).

Regarding the inverter system, two design types can be selected: a central or a decentralized design.

3.2.2 Central Inverter

Use of central inverters is the standard practice in large PV plants. The strings are combined in string combiner boxes and several combiner boxes are connected to an inverter. Typically the output power of central inverters is between 2000 kW and 8800 kW. The inverter can be installed in a compact station, in a container or as an outdoor system depending on the space for installation and the transport opportunities.

Typically, central inverters have a better price per MW and have less start-up and operation problems. But they require a specific training of the electricians for the commissioning procedure and in case of failures.

The efficiency is around 1 - 2% higher than of string inverters.

3.2.3 String Decentralized Inverter

String inverters are commonly used in small sized PV plants but there is also a trend to use them in large scale PV plants. The strings are connected directly to inverters, which can be up to 225 kW.

String inverters can be installed and exchanged by basic educated electricians and spare parts can be stored near the side. These inverters are easy to transport and handle. In complex terrain, with a lot of shading, the benefit is lesser module strings and therefore fewer modules are combined per inverter. Therefore, in case of partial shading of the PV generator, the mismatch losses are less because fewer modules are affected.

3.3 Control System

A PV plant is typically controlled by a SCADA System (Supervisory Control and Data Acquisition) so that it can be remotely managed and supervised. However, for preventive, planned and corrective maintenance, adequate staff and qualified contractors must be identified for the Operations & Maintenance (O&M) of the plant.

RDO

8 Site Description and Assessment

8.1 Geographic parameters

The plant site is in the southern region of the Balochistan province in district Lasbela about 20kms from main town Bela, see Figure 8 and Figure 9. Lasbela is a coastal district of Balochistan, it contains five tehsils with Bela being one of them.

Figure 8 Overview of Location / Bela 50 MWp with Proposed Bela Extension Site

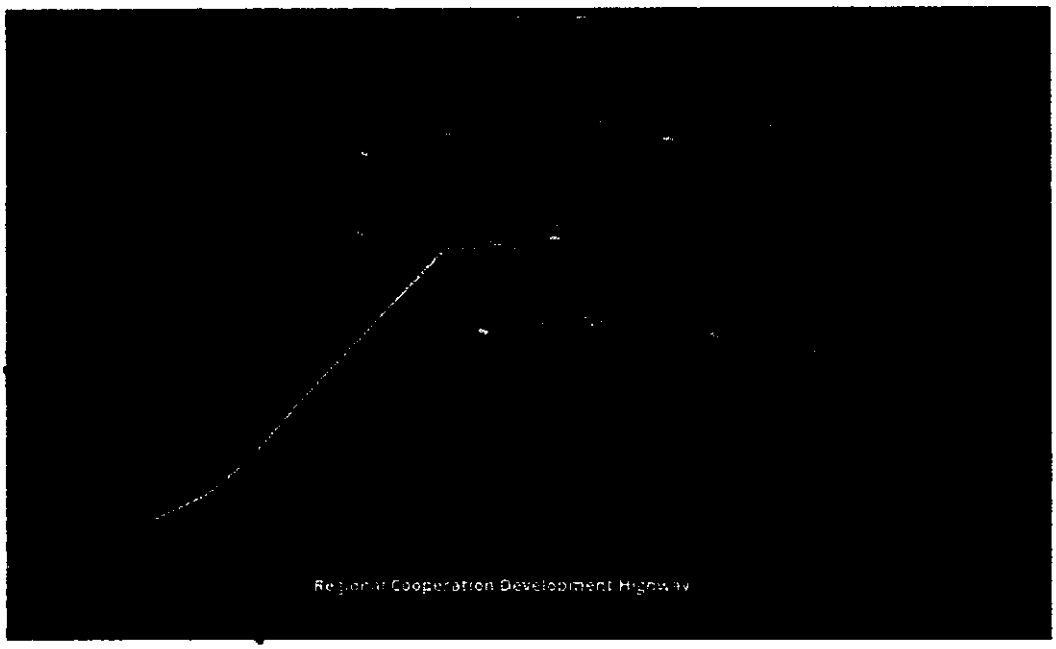


Figure 9 Site Map Showing Road Access

As it is a coastal district, there is some unwanted vegetation on the planned solar plant site which may cause shading of the solar generator (Figure 10 and Figure 11). This may cause temporary impact on some parts of the generator field. The vegetation will have to be relocated or removed before any construction begins.

Figure 10 Vegetation at site

Figure 11 Vegetation at site

Geographic parameters	The exact position for power plant has been finalized. However, there is unwanted vegetation.	**Relocation or removal of vegetation has to be considered.**

RAO

8.3 Climatic conditions

Climatic conditions have an influence on construction and foundation layout as well as energy production. The Balochistan Meteorological Department has only one weather station throughout Lasbela district. However, to evaluate the climate conditions of the plant site a detailed Meteorological study was carried out. From the study it was observed that the site has warm summers with average high temperatures up to 36° C.

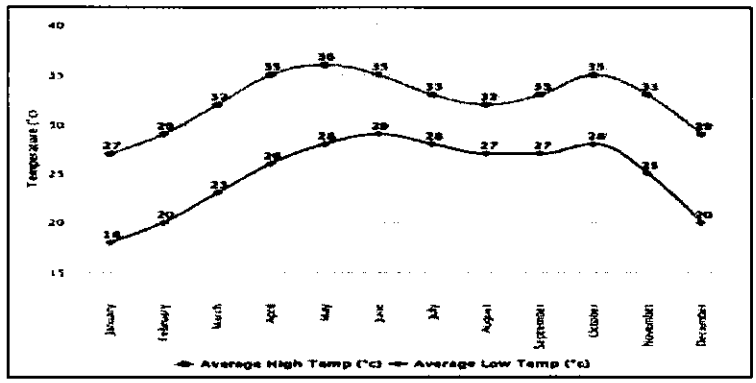


Figure 12 Site Temperature Range (source: Meteorological Study)

The monsoon season lasts from May through September with a peak in July and August. 60 – 70 % of the yearly rainfall comes in these months. The average rainfall per year in balochistan can range from 50 – 200 mm. In the Figure 13 the monthly precipitation for the plant site is shown.

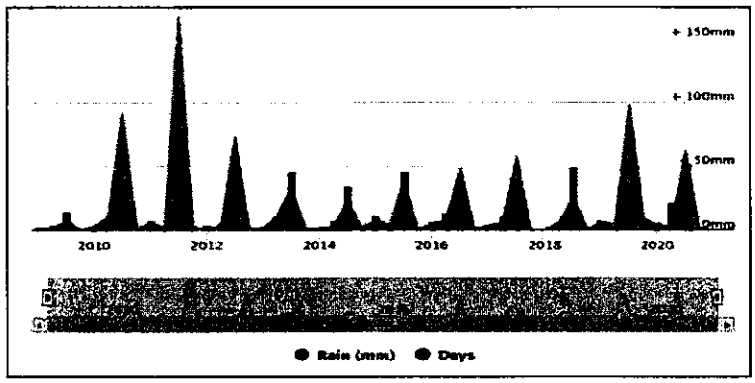


Figure 13: Precipitation at site (source: Meteorological Study)

Drainage from the site seems not to be an issue as the water will pass through the culverts in RCD highway. However, two dried torrential streams are found on the plant site for which detailed flooding analysis is carried out in the meteorological study for Bela 1.

The previous flood risk assessment covers the entire area and no new flood risk assessment report is required in view of the following factors:

It can be seen from the attached figure below that Bela extension is upstream of the Bela 1 thereby reducing the flood risk.

Figure 14 Torrential Streams – Bela 1 & Bela Extension

Torrential stream # 1 is further away from Bela extension compare to Bela 1

The dried stream is also away from the Bela extension site.

Below figure shows that the average elevation of Bela extension (altitude 98.25 m) is higher than Bela 1 (altitude 83.25 m) thereby reducing the flood risk

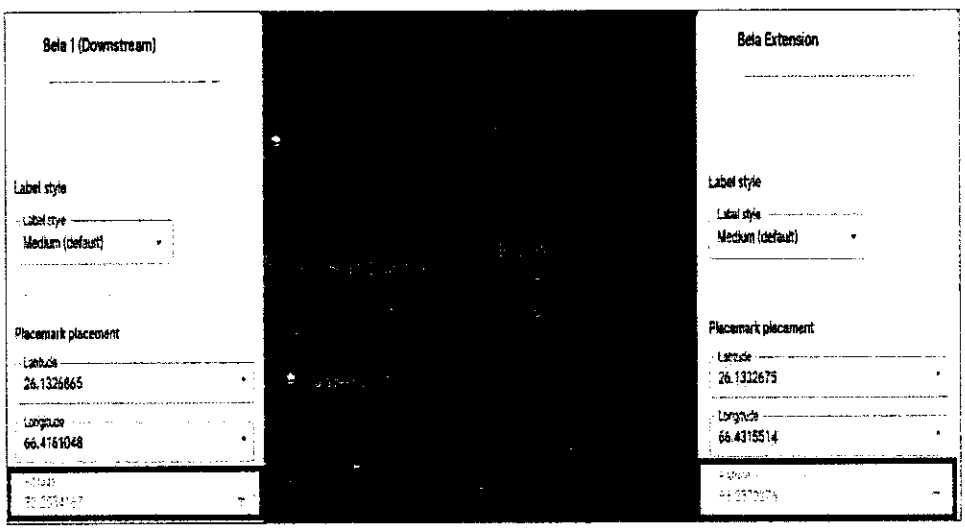


Figure 15 Average Elevation Bela 1 & Bela Extension

There is an average of 9 hours of clear sky per day throughout the year and 2900 - 3300 sun hours annually.

As per meteorological study, the average wind speed in this area peaks at 35 kmph whereas average maximum wind speeds range between 30 to 35 kmph.

Micro climate effects can cause dusty and windy conditions which should be evaluated more thoroughly. Broken up surfaces cause swirling dusts at wind speeds of higher then 5 - 6 m/s.

Also, frequent dust storms are observed in the area which might increase the soiling loss for the power plant and have an overall negative impact on its yield.

Impact on the project:

The inverters for this site should be designed for high ambient temperatures and all of the equipment including inverters, transformers etc. should be installed on an elevated terrain. Dusty conditions should be considered for the design of filters for all electrical equipment and buildings. The position of the modules and other structures should be chosen so that an intelligent drainage and seepage network can be incorporated into the site.

Climatic conditions	The climate conditions require robust components. Amongst other criteria, effective cooling, dust/sand filters and abrasive resistant materials shall be utilized. Bela extension (altitude 98.25 m) is higher than Bela 1 (altitude 83.25 m) thereby reducing the flood risk.	Low Risk – to be considered in detailed design

8.8 Other Environmental Aspects

No industrial activities are present nearby. There are few agriculture activities around the site. Pakistan Environment Protection Agency (Pak-EPA) has no regulations or requirements for solar power generation (PEPA Regulations 2000). Low rainfall and some wind cause slight erosion of soil. No protected wild plants or animals are reported at the site. The ambient air and noise quality meet the required National Environmental Quality Standards (NEQS) limits. Further details of environmental impact are highlighted in Initial Environmental Examination (IEE) of the plant site.

Potential risk of earthquakes is a clear point of consideration as the site is located in a region which is in the vicinity of the plate boundaries. Historical data shows that large magnitude earthquakes have occurred within more than 150 km radius from project area. The peak horizontal acceleration for a return period of 475 years is 0.34g. More information can be found in the Geotechnical study of plant site.

As the plant site is a large area so usually rodents live in such areas. They are known to eat plastics and cables. However, during site visits, only holes in the ground were seen.

Impact on Project:

No critical aspects can be detected as long as all obligatory safety rules are implemented e.g. for oil pollution from facilities and transformers.

Environmental Aspects	Precautions against rodents shall be made to protect cabling effectively.	**Low Risk – to be considered in detailed design**

8.1 Topography and Grounding

The topography of the plant site is mostly flat with some uneven areas. The soil is mostly rocky with dry shrubs growing on it.

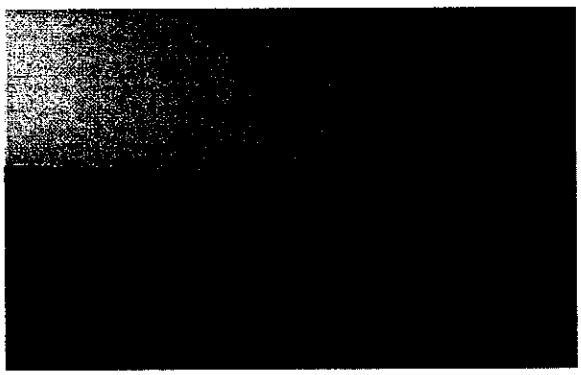


Figure 16 Vegetation

The natural soil layer is not suitable as the foundation bearing layer and the soil has to be prepared for heavy transport traffic, as frequent traffic is likely to loosen the soil surface. Details of soil can be found out in Geo-Tech study.

A more detailed analysis of the land including pictorial representation in figure below of cut and fill has been carried out through a sophisticated software. Additionally, the amount of cut and fill required for the land will is shared as Annexure to this report.

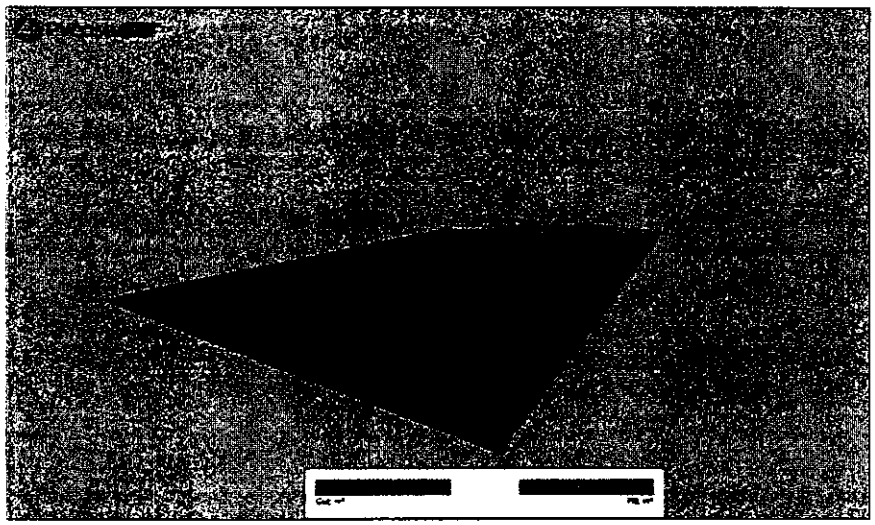


Figure 17 Cut and Fill – PV Area

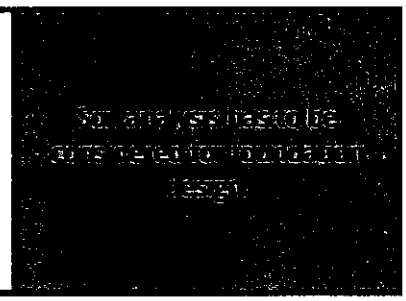
Table 3 Soil classification

Sr. No.	Test Pit No.	Depth (m)	Grain Size Analysis				Atterberg Limits		Sulphate Content (%)	Chloride Content (%)	pH Value	Soil Classification (USCS)	
			Cobble	Gravel	Sand	Fines	LL	PI				Group Symbol	Group Name
			%	%	%	%	%	%					
1	TP-11	0.0 - 2.0	7.0	46.0	36.0	11.0	Non-Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble
2	TP-12	0.0 - 2.0	12.0	37.0	44.0	6.0	Non-Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
3	TP-13	0.0 - 2.0	8.0	44.0	42.0	6.0	Non-Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble
4	TP-14	0.0 - 2.0	4.0	47.0	41.0	8.0	Non-Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
5	TP-15	0.0 - 2.0	10.0	33.0	45.0	12.0	Non-Plastic		0.05	0.13	7.0	SM	Silty Sand with Gravel
6	TP-16	0.0 - 2.0	8.0	23.0	57.0	12.0	Non-Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble
7	TP-17	0.0 - 2.0	9.0	56.0	23.0	12.0	Non-Plastic					GP-GM	Poorly Graded Gravel with Silt and Sand with Cobble
8	TP-18	0.0 - 2.0	12.0	31.0	48.0	9.0	Non-Plastic					SP-SM	Poorly Graded Sand with Silt and Gravel with Cobble

Impact on the project:

Overall conditions are more or less standard and various solutions can be settled to implement the project.

RAP

Topography and grounding	Foundations for Buildings have to be well prepared. Screw- or Ramming-Pile foundations present the best options for installation of PV-generator. The overall design, selection of components, and all constructions and foundations, as well as cabling have to be suitable for these conditions.	

RAD

8.1 Meteorology including Solar Resource

Pakistan is exposed to strong solar radiation, long hours of sunshine, and abundant solar energy resources. The annual sunshine hours range between 2900 - 3300 hours, with a daily average of 12 hours of sunshine.

Lasbela District is located in the south of Balochistan Province. For this location, the average sunshine duration sums up to 8.7 hours per day resulting in approx. 3250 hours of sunshine per year. The basic available meteorological data and the sunshine hours for year 2020 of the Meteorological Station of Lasbela district have been collected.

Table 4: Climate Data of the Region (Extract)

	Average daily Sun hours*	T Amb	Wind Vel
	h	°C	m/s
January	7.7	15.6	1.71
February	7.9	19.0	1.99
March	8.2	25.2	2.1
April	9.0	30.0	2.6
May	9.4	34.3	3.3
June	9.3	34.2	3.9
July	8.4	33.2	4
August	6.9	31.5	3.4
September	10	30.4	3
October	10.3	28.6	1.79
November	9.1	22.4	1.4
December	8.4	17.2	1.5
Annual average	2900-3300	26.9	2.56

Source: Meteorological Station Lasbela District

Sun hours: Hours

T Amb: Average ambient temperature (Meteonorm 8.0)

Wind Vel: Average wind velocity (Meteonorm 8.0)

For the first part of this feasibility study, we have used the solar irradiance resource from the Meteonorm 8.0 database. To determine the best data for the solar irradiation predictions, we will also analyze SolarGIS. Generally, different sources refer to the same satellite and ground measured data. In the following paragraphs, we will describe the differences and define the preferred meteorological dataset for the yield assessment.

The high level of global horizontal irradiation with the typical shape of seasonal variation through the monthly values shows differences of only 2 - 3% on annual basis between different sources.

RAO

SolarGIS provides irradiation data based on calculations from satellite images. The database represents long-term global data (1999 to 2021). The spatial resolution is 250 m. SolarGIS typically has an uncertainty of 3.5 % based on experiences in other countries of the MENA region and Middle East. For Pakistan and the region of Balochistan, we calculate an uncertainty of 5% due to missing close reliable reference meteorological stations with measurement for irradiance values.

Meteonorm uses several sources e.g. different satellites and ground stations for mean values. The main time period is 1996 – 2015 (totally 1942 stations). The most important source of radiation data is the Global Energy Balance Archive (GEBA, https://protos.ethz.ch/geba/). This database is also used to extract uncertainty, variability and trend information (770 stations are used for this). Additionally, the global radiation values of the stations of NREL's TMY3 database (http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2010/tmy3/) with the highest quality level (NSRDB class I) have been included in the Meteonorm database. Interpolation of global radiation data is based on a mixture of ground measurements and satellite data. The calculation of the uncertainty values of global radiation is based on (1) uncertainty of ground measurement based on long term variability of local climate, (2) uncertainty of interpolation of ground measurement and uncertainty of satellite-based data and (3) on uncertainty of splitting into diffuse and direct radiation and inclined planes. Four parameters have been classified: (1) duration of measurement period, (2) standard deviation, (3) decadal trend and (4) end of measurement period. Interpolation of ground stations is modelled with help to the nearest station.

High latitudes and high albedo would increase the uncertainty even more which is not the case for the site. The uncertainty of satellite data is given by Meteonorm with 3 - 8 %. The overall uncertainty calculated internally by the Meteonorm software comes out with 3.1% based on the available 20 years long term data set for this region for global horizontal irradiation (Ghi).

For a more exhaustive overview, the different sources can be viewed in detail in Table 5 and Figure 18.

RAV

Table 5: Results from different Sources for Irradiance Data

Irradiation Sources Bela Average monthly sum	Meteonorm 8.0 1996-2015 GlobHor kWh/m²	Solar GIS 1999-2021 GlobHor kWh/m²
January	123.4	128.9
February	138.8	144.1
March	179.9	191.5
April	191.6	194.3
May	212.3	218.8
June	195.0	196.7
July	166.6	172.9
August	161.2	168.0
September	167.4	184.0
October	156.0	169.5
November	136.2	138.8
December	118.5	127.5
Annual sum kWh/m²*a	1947.0	2034.8

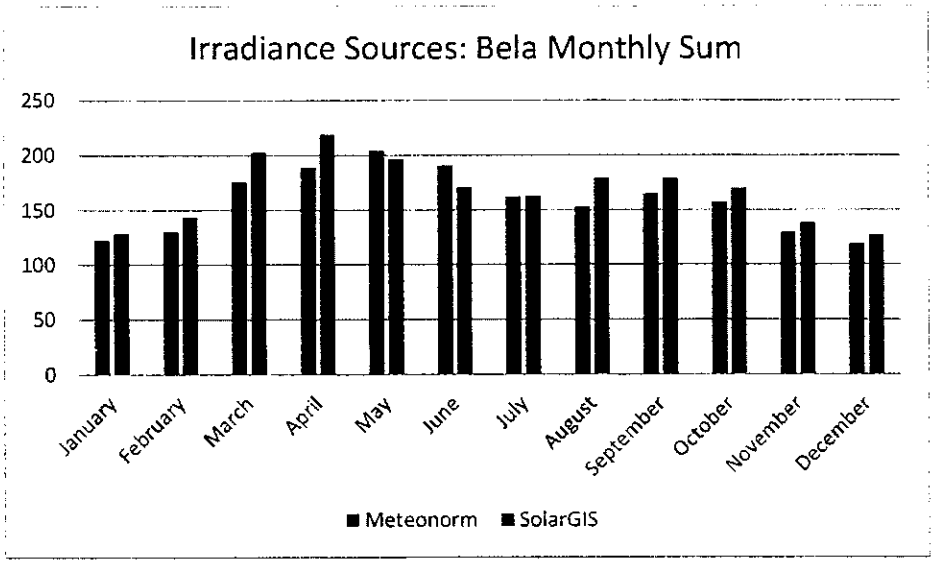


Figure 18 Comparison of Results from different Sources for Irradiance Data

Based on the consultant's experience, these irradiance values are in close proximity and deviate only slightly. For energy yield analysis in this Feasibility Report, Meteonorm and SolarGIS data will be used.

Irradiation Data	There is a potential bias of satellite irradiance data for this area by 3-5% towards the downside of the expected value	**Ground measurements of at least 6 months should be done before financial close to reduce the uncertainty**

8.2 Transport Access

The site lies on the main RCD highway and has a link road too. The nearest airport is located at a distance of 180 km at Karachi. Sea freight may be shipped to Karachi harbor and then be transported to the site via road.

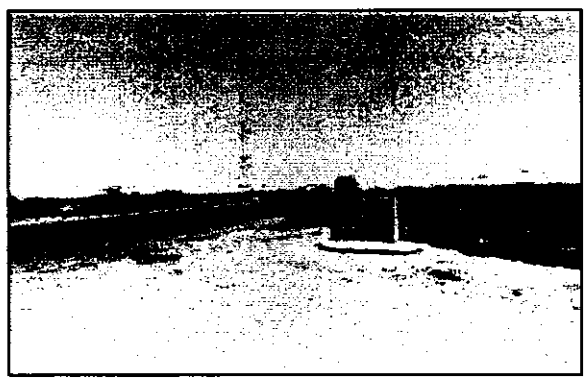


Figure 19 Access Road (RCD Highway)

Transport Access	The accessibility to the PV development area has been established via RCD highway. Construction and service roads within the Plant's area have to be erected.	**Low Risk - to be done during detailed design**

8.3 Water Access

Water will be required for dust prevention during the construction phase and for cleaning of modules in the operation phase.

8.3.1 Water Demand

The majority of the water will be needed for regular cleaning of the modules. Furthermore, small amounts of water will be needed for domestic consumption (e.g. living), landscaping and dust prevention on roads / tracks. Wet cleaning of the modules is supposed to take place on a monthly basis. The total demand of fresh water is estimated to be approx. 45325 m^3 / year including the amount for domestic, landscaping and dust prevention consumption for the power plant. The daily water demand equals to approx. 12.5 m^3 / day per 50 MWp Solar power plant.

RAD

However, after extensive analysis of the site conditions, it is suggested that the modules be cleaned via dry brushing at least once per week to ensure maximum output. In case of weekly wet cleaning, the water demand can rise further.

Water supply

Inquiries from the locals living in surroundings of Bela site and from feasibility study for Bela 50 MWp project, indicates that reasonable quality of ground water is present at about 60m to 70m depth below the existing ground level. A solar tube well has been installed in nearby village which is about 0.5km to 1km from the project site. For a sustainable source of water, it is better to install a tube well with RO plant within the project site boundary after performing detailed ground water survey.

Water reuse treatment disposal

The water utilized for cleaning the modules will not be reused or treated after the module cleaning procedure. The water will be let to seep away into the ground, as catching the water before dropping off the modules is a very complex process. As environmental pollutants, e.g. dust, sand, and bird droppings, are mixed within the used cleaning water, those naturally occurring elements are not regarded to give any negative influence to the PV plant's soil. However, in long term of solar plant operations, it can be efficient to apply some type of water recycling system to reduce fresh water consumption for module cleaning process. However, the module manufacturer's specifications regarding water quality have to be respected.

Water used for domestic supply is supposed to be collected in underground waste water storage tanks. A procedure to recycle grey water, e.g. from lavatory, is not scheduled currently, but recommended to be applied for efficient reduction of fresh water consumption.

A waste water treatment plant is currently not intended, but recommended to be applied. Waste water from domestic use shall not be dissipated into the ground without treatment.

Water management plan

We recommend carrying out a water management plan for construction and operation of the solar power plant. In particular:

- Water demand of the plant (e.g. for construction and cleaning of the modules).
- Water supply to the plant (based on the hydrological situation in the area).
- Water reuse / recycling schemes (e.g. waste treatment, storage ponds...).

RAD

- Waste water discharge (e.g. quality and amount of waste water, run-off systems, etc.).
- Water-related (hydrological) environmental impact analysis.

Water Access	A water management plan for construction and operation of the plant, as specified above shall to be carried out.	**Low Risk - to be done during detailed design**

8.8 Grid Access

Currently, there is a 66kV line which would be dismantled and a new 132kV would be established to export power from the solar power plant. A detailed grid interconnection study is recommended.

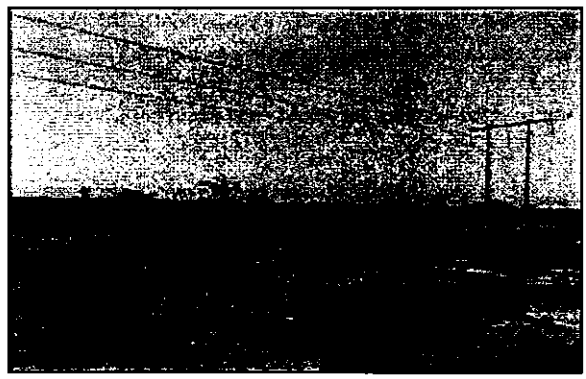


Figure 20 Existing 66kV line

Grid Access	Currently, there is no available line to get electricity during construction phase. Therefore, a MV power line should be made or diesel generators should be used to provide electricity during construction phase.	**MV Power Line should be made or diesel generators should be used. Erection of MV/HV step-up stations to be considered during planning phase.**

8.9 Facility Access

The PV development site is near to Fire Brigade office and police station in Bela.

It should be checked if the fire station can meet the fire protection requirements of the solar power plant, to conclude, if a dedicated fire station is required or not.

According to the features of the plant site, and on the basis of the relevant specifications of Code of Design on Building Fire Protection and Prevention (GB50016-2006), fire hydrants will be provided in the general services area and the 132 kV step-up station. The outdoor fire hydrant shall be erected along the roadside, and the arranged distance between the hydrants shall be no more than 120 m. The fire devices shall be designed according to the secondary load power supply standard, using double circuit power supply and automatic switching at the end. The fire devices shall use fire protection or fire-resistant cables. The fire protection and firefighting system is part of safety requirement and shall be designed and provided by EPC contractor.

There are nearby hospitals therefore, the distance to the hospital is acceptable. An emergency kit has to be provided on site, along with an emergency guideline, the emergency call number and a description of the travel route to enable a rapid aid.

The distance to the police station is also acceptable, but it is recommended that the site has its own full time security staff located near or on the site.

Facility Access	Access to public facilities (fire / police station, hospital) is well available nearby. Fire hydrants have to be established along the roadside in a distance of max. 120 m.	To be initiated

[illegible] Plant layout and description of mechanical equipment

[illegible].1 Power supply infrastructure

Presently, there is no proper power infrastructure at plant site. An 11 kV overhead power line should also be made available for auxiliary loads or diesel generators should be used. For sufficient power supply during construction phase, it is recommended to extend the power line.

[illegible].2 Power plant technology configurations

In general, several technology configurations can be implemented.

The most economical technology configuration is a fixed mounted module installation with a tilt to the south with central inverters. The density of installed PV power to ground space is highest and the specific energy output by installed PV power is lowest.

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Alternatively, a dual axis tracking system represents the complete opposite:

- It is more expensive, with highest O&M cost.
- It has the lowest density of installed PV power to ground space, and
- The highest specific energy output of installed PV Power.

A compromise of these two technologies lays in a single axis tracking system. This option offers a good cost to power ratio. Due to this insight, several versions of single axis tracking systems (with horizontal North-South axis) may be compared.

Single axis tracking installation is considered for the purpose of this feasibility, because it offers the perfect mix of cost and production.

Pile rammed substructure is the most recommended type of foundation for PV racks.

4.3 Basic System Design

In the following paragraphs, the main assumptions and the components preselected for the Energy Yield Assessment can be found.

4.3.1 Preliminary layout

The preliminary layout illustrates a standard configuration for a solar plant of this scale. To refine the layout, advanced optimization techniques were employed using the PVCase software, leveraging online terrain models and creating a detailed topographic mesh. Areas where the terrain slope exceeds 5 degrees have been identified and designated as exclusions.

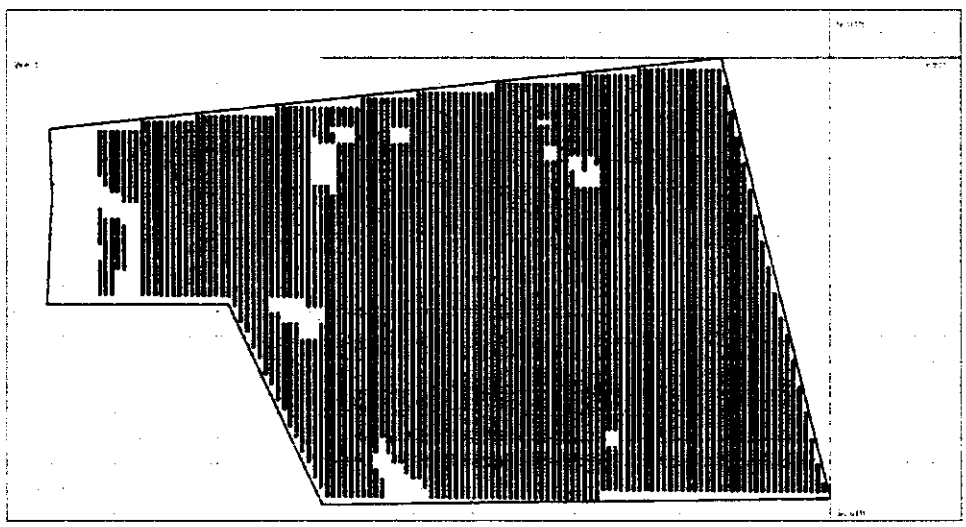

Figure 21 PV Plant Layout

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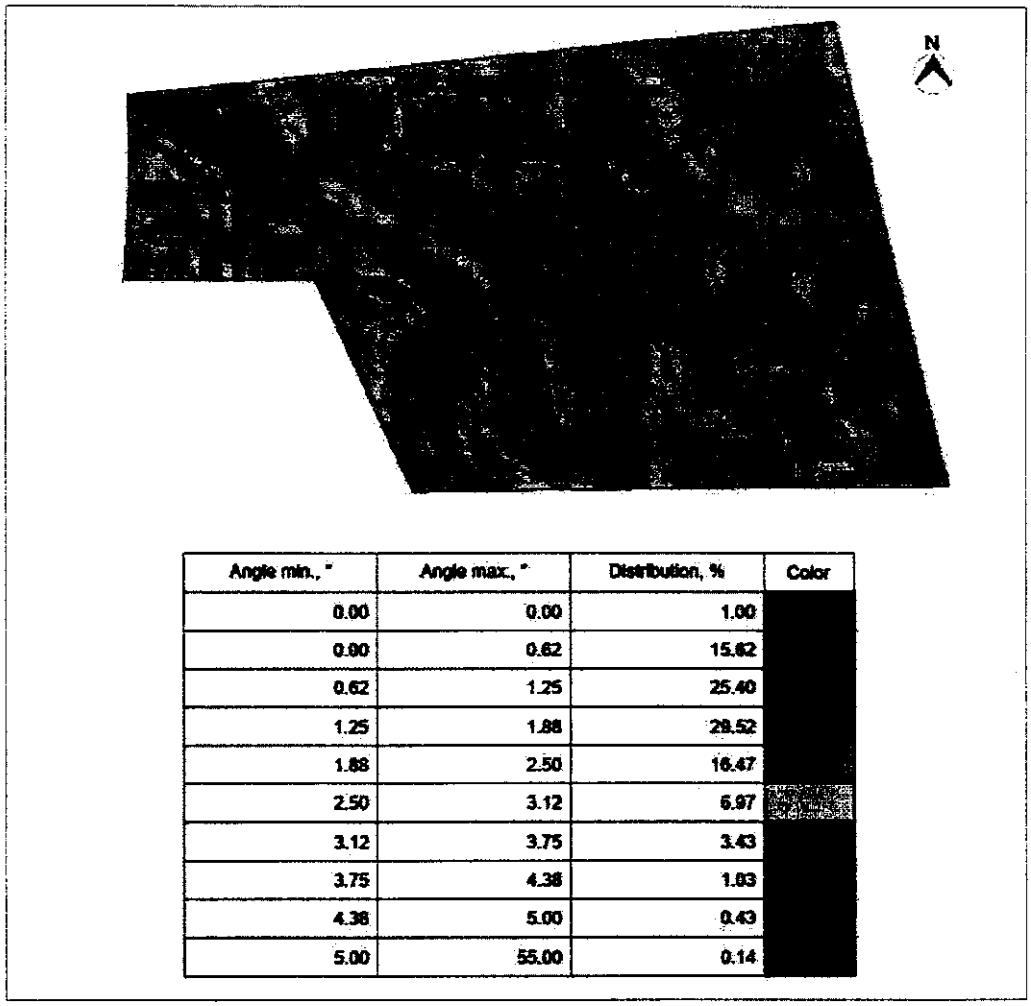

Angle min., °	Angle max., °	Distribution, %	Color
0.00	0.00	1.00	
0.00	0.62	15.62	
0.62	1.25	25.40	
1.25	1.88	29.52	
1.88	2.50	16.47	
2.50	3.12	6.97	
3.12	3.75	3.43	
3.75	4.38	1.03	
4.38	5.00	0.43	
5.00	55.00	0.14	

Figure 22 Color Coded Terrain

Moreover, careful consideration must be given to the integration of internal roads, primarily dirt roads, during the detailed layout planning. These roads will serve as access routes and the placement of the inverter transformer station will be strategically positioned along these pathways for efficient operations.

Furthermore, identification of an appropriate location for the substation is necessary. Ample land is available to accommodate its infrastructure requirements.

4.3.3 Modules

The half-cell (144) Mono-crystalline PV modules, with a positive tolerance were selected for the system design. This type of module is state of the art. Such modules are new in the market but are available in sufficient amounts to implement a 50 MWp solar plant.

Quality of the modules will be assured by a pre-construction factory-audit of the manufacturer, laboratory testing of recently produced modules and on-site testing of modules delivered to construction site.

4.3.4 Structure

For mounting structure, a single axis EW tracking is selected. Single axis tracking offers more yield and does not have a dramatic impact on the overall project cost. Tracking systems are becoming common and have proven their reliability in several PV projects throughout the world.

The tracking structure has a maximum angle of 60° and minimum angle of -60° to enable sun exposure and high energy yield.

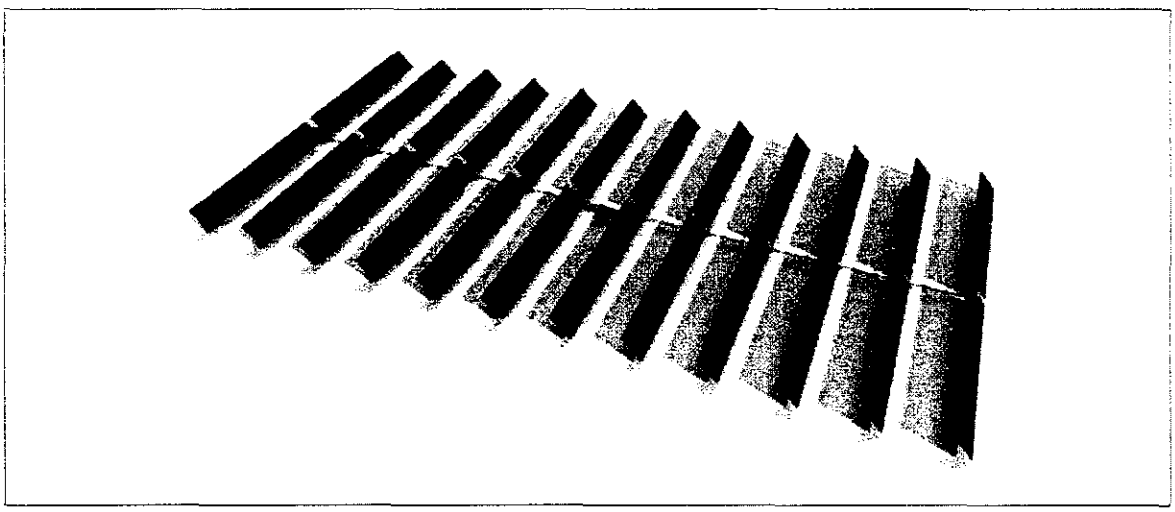

Figure 23 Schematic of PV Mounting Structure

4.3.5 Cables

The electrical interconnection between PV modules and inverters is designed to be made of minimum 4 mm² copper cable. This is a standard approach according to international best practice and suitable for the project.

7.3.4 Inverters

For this feasibility study centralized type inverters were selected. This type of inverter is a typical and high-quality state of the art product suitable for the project. Inverter quality shall be secured by a factory-audit of the manufacturer before production and delivery.

Centralized type inverters were selected due to their capacity of dynamic grid support, which is a relevant point in the project site. Additionally, the specific purchase price per MW is lower, and efficiency is higher than for decentralized inverters.

7.3.5 Substation

The substation is considered as a critical part of the project concerning the time line for its construction. Availability and delivery time of the chosen components and design criteria, acceptable to KE, have to be considered.

A standard substation consisting of a Medium Voltage part including HV transformer, HV portion of the plant, double bus bar single breaker scheme designed for HV portion is recommended for utilization in this project.

7.3.6 Monitoring

A SCADA system of high temporal resolution (minimum should be 15 Minute average values) is recommended to be adopted. It is also recommended to measure fine resolution of plant components, e.g. in one channel combination of two module strings only.

To achieve an optimum energy yield, it is recommended to keep staff operating on site for continuous monitoring of the performance of the solar plant.

7.3.7 Security

To secure the site against theft and vandalism as well as for staff's protection, a 2m high fence at least with barbed wire on top should be erected. As an alternative, a solid concrete wall should be erected. Additionally, a video surveillance system connected to a maintenance office is recommended to be installed to remotely supervise activities on site.

7.4 Required infrastructure developments

- Water tube wells should be established to provide water for the constructions phase.
- Either an 11kV line should be set up to provide electricity during construction phase or diesel generators should be used.

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4 Grid Interconnection

4.1 Assessment of possible electrical plants and their impact on the power network

In developed countries, many years of experience with grid connected renewable energy power plants and previous experiences in Pakistan have shown that it is possible to integrate these power plants into the grid under consideration of clearly defined technical aspects. PV plants, especially, are also able to offer reactive power 24/7 and can thereby help stabilize the grid.

4.2 Possible electrical plants and their impact on the grid

In general, measures have to be taken in order to assure that all types of electrical faults of the PV plant are managed in accordance with the relevant national grid code (NEPRA Grid Code June-2005) and potentially existing so-called "Technical Conditions for Grid Connection" of the corresponding grid operator. The needs can be fulfilled by selecting the right safety equipment and a safety concept which includes all components from inverter up to the grid connection point.

4.3 Impact on the transmission network

With respect to the transmission grid at high voltage level, the conditions for safe grid integration 50 MW nominal AC power needs to be formally assessed externally and signed off. The corresponding key indicators for this assessment are the short circuit power and the impedance angle of the grid at the grid connection point.

4.4 Balancing power

Due to their very nature, PV plants as such are not suitable for providing balancing power. According to the installed inverters, the PV plant has to be operated far below nominal power at certain times of the day to ensure the requested reactive power. Usually, inverters react slowly to the request to change the share of reactive power. Due to the slow reaction of the inverters and the need for fast power balancing, a compensation system has to be implemented. The PV plant needs to be formally assessed, so that adequate measures to provide the required balancing power can be implemented and an overall monitoring and control system installed.

4.4 Grid control strategies

Basically grid control strategies can only be set up with a somewhat clear understanding of the potential energy mix of a specific region in the future. Once this mix is known at least on "target basis", it is feasible to exploit the potential of modern inverters to the full extent, for instance their capabilities of providing reactive power on demand in more or less real time or in case of low voltage.

4.5 Technical specifications

Prior to setting up technical specifications for the grid connection, a comprehensive analysis, of the existing grid codes, relevant guidelines and national regulations, has to take place with the target to establish the exact conditions for a safe, technically and economically viable grid connection of the solar plant. Following this analysis, detailed technical requirement specifications, concerning the behavior of the grid connected solar power plant, can be set up in order to make sure that faults and deviations from the established set of conditions result in predefined actions. Key issues in this respect are:

- Decoupling of the solar plant in case of short circuit and voltage or frequency deviation above or below defined thresholds
- Dynamic grid support in case of short term voltage drops
- Provision of reactive power and control of effective power as required

4.6 Approvals

There has to be a grid integration and connection study to confirm the conditions of integration of this 50 MWp solar plant. In particular:

- Potentials and limitations for the integration of the power product of the different scales of SPV plants into the daily and yearly load curves.
- Quantitative and qualitative needs and already available grid-inherent potentials to provide balancing power.
- Quantitative and qualitative needs for additional balancing power.
- Further risks and necessary risk mitigation measures for ensuring grid stability.
- Required power quality output parameters of the plant.
- Technical requirements of inverters, transformer, switching devices, circuit breakers etc.

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- Control parameters and control interfaces to the grid operators control schemes.
- Further risks and necessary risk mitigation measures avoiding and handling electric failures of the plant.

Grid connection	The specific requirements and approval for grid connection need to be confirmed by NEPRA / KE	[redacted]

2 Energy Yield Assessment

2.1 Solar Irradiation Data

The given sunshine hours can only indicate the volatility through the years which is around 20%. Besides the sun hour data, there are other sources for irradiation data as well e.g. satellite. To calculate energy values, the dimension to be taken into consideration should be expressed in kWh/m² instead of sun hours. For a first energy yield analysis, the annual horizontal global irradiation was evaluated 1900.6 kWh/m² (Meteonorm data base).

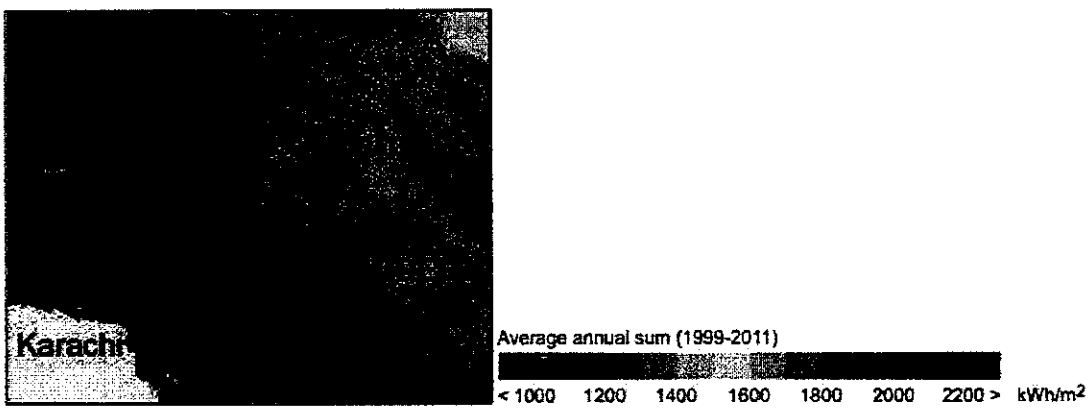

Figure 24 Global horizontal Irradiation (GHI) for Pakistan
(Source: SolarGIS)

Table 6: Global horizontal Irradiance (Ghi) and Ambient Temperature (Ta)
Monthly means (by Meteonorm 8)

Month	GlobHor (Ghi)	T Amb (Ta)
	kWh/m²	°C
January	123.4	15.6
February	138.8	19.0
March	179.9	25.2
April	191.6	30.0
May	212.3	34.3
June	195.0	34.2
July	166.6	33.2
August	161.2	31.5
September	167.4	30.4
October	156.0	28.6
November	136.2	22.4
December	118.5	17.2
Year	1947.0	26.9

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Table 7 Global horizontal Irradiance (Ghi) and Ambient Temperature (Ta) (SolarGIS)

Month	GlobHor (Ghi)	T Amb (Ta)
	kWh/m²	°C
January	128.9	18.97
February	144.1	21.1
March	191.5	26.5
April	194.3	30.1
May	218.8	33.5
June	196.7	32.9
July	172.9	31.4
August	168.0	30.8
September	184.0	30.1
October	169.5	29.2
November	138.8	25.0
December	127.5	19.3
Year	2034.8	27.4

The deviation of single years from the long-term average can amount up to 15% and can show the same trend over several years. To minimize deviations for yield calculations, it is necessary to take into account a long term average of irradiation.

The figure below demonstrates the maximum deviation from the long term average in the years 1937-1999 at the Potsdam site. In fact, there will always be deviations in irradiance between each year of operation. Regarding the long term of operation these deviations will lead to an average irradiance very close to the number given in the yield analysis.

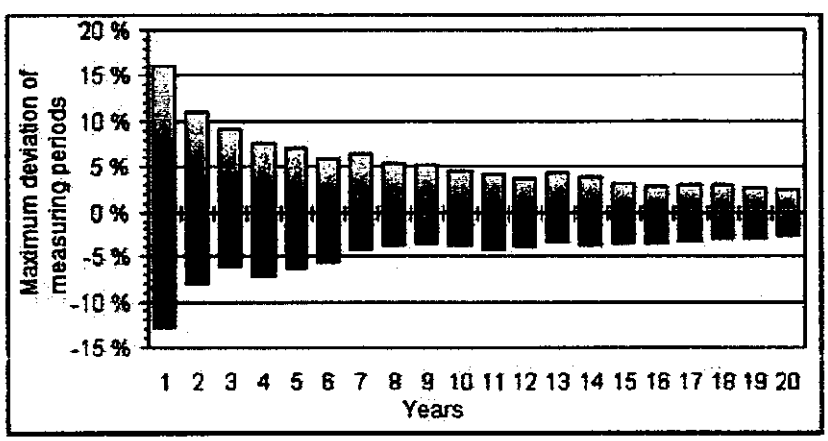

Figure 25 Deviation of Solar Irradiance from long term average

For the PV plant's geographical location, the uncertainty of irradiance measurement data is 3.1% (source: Meteonorm software, Version 8.0), as the nearest ground measurement station for comparative values is only available at a distance of 106 km.

2.5 Shading analysis

From several site visits, we can summarize that terrain causes no relevant shading. There are a few existing settlements and vegetation, which will have to be relocated and removed before any construction begins.

2.6 Performance ratio

A solar cell is the smallest semiconductor element within a PV module to perform the immediate conversion of sunlight into electrical energy by the photovoltaic effect. Depending on the employed technology, the degree of efficiency amounts up to 21 %. This value seems to be quite low but the free supply of primary energy (solar radiation) and the corresponding absence of power dissipation in the conventional sense should be taken into consideration. By using appropriate technology, the direct current generated by the solar modules is converted into alternating current that can be fed into the public power supply.

The conversion into alternating current implicates losses depends on the PV system configuration, the choice of components and to a minor degree on the local site conditions.

If these losses are identified and evaluated, the system operation quality – the performance ratio (PR) – can be ascertained.

The PR is stated as percentage and describes the relationship between the actual and theoretical energy outputs of the PV plant considering module efficiency.

PR = energy yield / (unshaded annual irradiation on array surface * module efficiency according to STC)

$$PR = 100 \times \left[\frac{E_{AC}}{E_{Irradiation} \times A_{Array} \times \eta_{STC}} \right]$$

E_{AC} = energy coming from the inverter or measured at the energy meter in kWh

$E_{Irradiation}$ = unshaded irradiation at module level in kWh

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A_{Array} = total surface of all solar modules in m^2

η_{STC} = module efficiency at STC

The module efficiency (contrary to the cell efficiency) considers the gross module surface and can be calculated as follows:

$$\eta_{STC} = \left[\frac{P_{Module}}{A_{Module} \times 1.000}\right]$$

2.2 Expected Losses

A fundamental step in understanding this important quality criterion is the explanation of the typical loss factors affecting the energy yield with different weights. In every simulation step, all described aspects have an hourly impact on the overall result.

All technical losses described below are calculated in the energy yield analysis depending on system design and chosen components and operation conditions.

2.2.1 Irradiation gain by modification of modules

In non-equatorial zones, the degree of irradiation at module level can be improved by the inclination of modules southwards (northern hemisphere) or northwards (southern hemisphere) against the horizontal. When reaching a normal module inclination angle of 25 - 30 degrees, the irradiation gain can amount up to 10 – 15% in temperate zones. It is expressed by the surface-factor F (A) ~ 1.10 – 1.15.

2.2.2 Horizontal losses because of shading

If there are objects in the environment of the planned PV power plant causing shading of the solar generator. These shadings can be considered and simulated by a shading analysis. A distinction is made between "horizon shading" and "nearby shading".

Horizon shading causes a shading effect which has a permanent impact on the entire generator field. The simulation considers this effect by adjusting the horizon line. Objects that are in a large distance to the modules, e.g. mountain ranges, are typical horizon shadings.

Nearby shading has a temporary impact only on some parts of the generator field. Most parts of the site remain unaffected. Objects at close distance to the PV modules cast shadows, e.g. power poles, trees also there can be shading between different rows of PV modules. Greater distances between the mounting rows will lead to less nearby shading, as the effect of shading at low sun-angle will reduce.

Depending on the site conditions, these aspects are considered in the yield simulation.

Best in class shading losses would be represented by values in the range of up to 1%. Acceptable values would range between 1% up to 4% always depending on the required use of ground and intended energy yield of the PV plant. Shading above 4% would be unacceptable.

2.4.3 Meteorological losses because of soiling

Dirt on the modules also causes shading effects which can change over time and seasonally. This shading impact on the energy yield depends for example on the surrounding landscape, cultivation and precipitation. The impact can only be appraised and is based on experience values as well as contracted cleaning. Consequently, the uncertainty is high. It is recommended to clean the PV modules regularly and based on an ongoing assessment of the actual soiling during operation.

Best in class soiling losses would be represented by values in the range of up to 2%. In Pakistan, acceptable values would range between 1% up to 5%. Soiling above 5% would be unacceptable.

2.4.4 Meteorological losses because of temperature fluctuation

Ambient temperature and level of irradiation have an influence on the cell temperature and so affect the energy conversion process. According to the defined STC value of 25°C the electrical power output decreases with higher module cell temperature and increases with lower cell temperature. The PV module model shows this characteristic by means of temperature coefficients for current and voltage.

Best in class losses due to ambient temperature would be represented by values in the range of up to 9 % under the site conditions. Acceptable values would range between 9 % up to 11 %. Temperature fluctuation losses above 11 % would be un-acceptable.

2.4.5 Meteorological losses because of reflection

In particular inclined irradiation causes reflection of sunlight at the glass and solar cell surface. Although this causes a small effect, it is considered by an empirically determined factor: IAM (Incidence Angle Modifier). By default, the factor is set to 0.05.

Best in class losses due to reflection would be represented by values in the range of up to 1.5 %. Acceptable values would range between 1.5 % up to 2.8 %. Reflection losses above 2.8 % would be un-acceptable.

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2.2.2 Thermal losses because of low irradiance level

The irradiance varies over time (hourly and seasonally). The efficiency of the conversion of irradiance into electricity (expressed as efficiency the PV modules) is – due to manufacturing processes generally not identical for the entire width of irradiance levels. The PV module model shows this characteristic by means of different efficiencies for different irradiance levels.

Best in class losses due to this effect would be <0.2%. Acceptable values would range between 0.2 % up to 0.8 %.

2.2.7 Thermal losses because of module quality

Due to production related reasons and/or contractually allowed tolerances, the PV module output power under Standard Test Conditions might deviate.

Typical losses due to PV module quality are nowadays negative as only positive STC power tolerances are allowed.

Best in class losses due to module quality would be represented by values in the range of up to -1.0 %. Acceptable values would be negative as only positive tolerances are allowed.

2.2.8 Thermal losses because of array mismatch

Array mismatch losses are mainly caused by the fact that in a string of modules the lowest current drives the current of the whole string. With its statistically distributed parameters of current, voltage and power in each module, most of the modules will not be driven at their optimum operating conditions.

Best in class losses due to mismatch would be represented by values in the range of up to 0.5%. Acceptable values would range between 0.5% up to 1.5%. Mismatching losses above 1.5% would be unacceptable.

2.2.6 Thermal cable losses

The whole wiring of the solar power plant is subjected to cable losses due to the natural resistance of conductors - the ohmic resistance. Due to small-scaled plant design and cable dimensioning for maximum performance, losses normally amount to 1 - 2%.

Best in class ohmic losses would be represented by values in the range of up to 1.5%. Acceptable values would range between 1.5% up to 2.5%. Ohmic losses above 2.5% would be unacceptable.

8.4.10 Technical Losses because of DC to AC Inversion

The conversion of direct current (DC) into grid compatible alternating current (AC) entails inevitable losses. The inverter model shows this characteristic by means of different efficiencies for different load levels and input voltages.

Best in class losses due to DC/AC inversion would be represented by values in range of up to 1.0%. Acceptable values would range between 1.0% up to 2%. DC/AC inversion losses above 2% would be unacceptable.

8.4.11 Technical Losses because of Transformation (Transformer Losses)

Transformer losses depend simultaneously on several parameters. Basic technical parameters like ohmic and magnetic resistance can be taken into consideration.

Best in class losses due to voltage transformation would be represented by values in range of up to 0.6%. Acceptable values would range between 0.6% up to 1.2%. Transformation losses above 1.2% would be unacceptable.

8.4.12 Technical Losses because of Self-Consumption

Inverters (operation, fans, heating ...), monitoring and security systems as well as communication systems consume power. During energy production the necessary power is reducing the current output of the PV plant.

Best in class self-consumption losses would be represented by values in the range of up to 0.2 %. Acceptable values would range between 0.2 % up to 0.5 %. Self-consumption losses above 0.5 % would be not acceptable.

8.4.13 Technical Losses because of Plant-Availability

The technical availability of a PV plant crucially determines the energy yield. Outages due to failure of fuses, disconnected strings or broken inverters are likely to occur and therefore must be considered in the expected energy yield.

Best in class technical availability losses would be represented by values in range of up to 0.3%. Acceptable values would range between 0.3% up to 1.2%. Availability losses above 1.2% would be unacceptable.

8.4.14 Technical Losses because of Light-Induced Degradation (LID)

Light-Induced Degradation or sometimes referred to as initial degradation is a potential slight performance drop of the PV modules during the initial hours and days when exposed to solar irradiance which can affect several solar cells. Manufacturers of crystalline modules do not always take into account the potential LID effects when drafting the STC power specifications on the nameplate. If a manufacturer fails to take the

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LID into account during the power classification of the PV modules, this value will be used to regard this effect within the simulation.

Best in class LID losses would be represented by values in the range of up to 1.0 %. Acceptable values would range between 1.0 % up to 2.5 %. LID losses above 2.5 % would be not acceptable.

Yield losses because of weathering and degradation

Changes in the energy yield because of weathering need to be considered in the expected long term energy yield. As degradation of the PV modules is a continuous process, depending on time, performance will decrease over time of operation. Performance guarantees of the manufacturer and different practical results diverge a lot. Former long-term study findings cannot be applied easily to PV modules produced with today's manufacturing processes and product features. But it is assumed that today's processes and technologies lead to a higher module quality. The consideration of an annual correction value for weathering / degradation is recommended for the overall result.

Best in class degradation losses would be represented by values in the range of up to 0.1 %. Acceptable values would range between 0.1 % up to 0.5 %. Degradation losses above 0.5 % would be not acceptable.

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2.4 Overview to technical losses

As the technical design is not decided yet, our calculations are based on typical assumptions and state of the art components. The abovementioned described losses come out of the yield calculations of a so called waterfall diagram. Table 8 summarizes values of loss-factors.

Table 8: Overview to Loss Factors and Quality Classification

Loss Factor	Best in Class	Non Acceptable
	%	%
Shading	< 1.0	> 4.0
Soiling	**< 1.0**	**> 5.0**
Low irradiance	< 0.2	> 0.8
Ambient temperature	**< 9.0**	**> 11.0**
Reflection	< 1.5	> 2.8
Module quality performance	**< -1.0**	**> 0.0**
Module mismatch losses	< 0.5	> 1.5
Cable losses	**< 1.5**	**> 2.5**
DC/AC conversion	< 1.0	> 2.0
Voltage transformation	**< 0.6**	**> 1.2**
Self-consumption	< 0.2	> 0.5
Availability	**< 0.3**	**> 1.2**
Light-Induced Degradation (LID)	< 1.0	> 2.5
Degradation on average	**< 0.1**	**> 0.5**

See below the results for single axis tracking [-60° to 60°] system.

General explanation of the waterfall diagram: (1) Starting with the Horizontal Global Irradiance: the tracking installation increases the irradiance on PV module plane. Near shadings, soiling losses and glass reflections reduce that gain. (2) Once the irradiance

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reaches the active cell, it is converted to electric power ("PV conversion"). (3) Further, electrical losses occur in the electrical system depending on the characteristic behavior of the components used, cabling design, and operation of the equipment. Performance ratio of the whole system is calculated between "Energy injected to grid" and "Array nominal energy (at STC efficiency)".

Four simulations have been run for a single axis tracking system [-60° to 60°]. Two on Meteonorm with using Mono-Perc and Bifacial modules and another two on SolarGIS using the same technologies. For Reference one loss diagram using Meteonorm as the irradiance source and Mono-Perc modules is shown in Figure 26. The losses are in the expected range for the design and environmental conditions and have been kept same in all simulations. All PVsyst simulations are attached as Appendix 1.

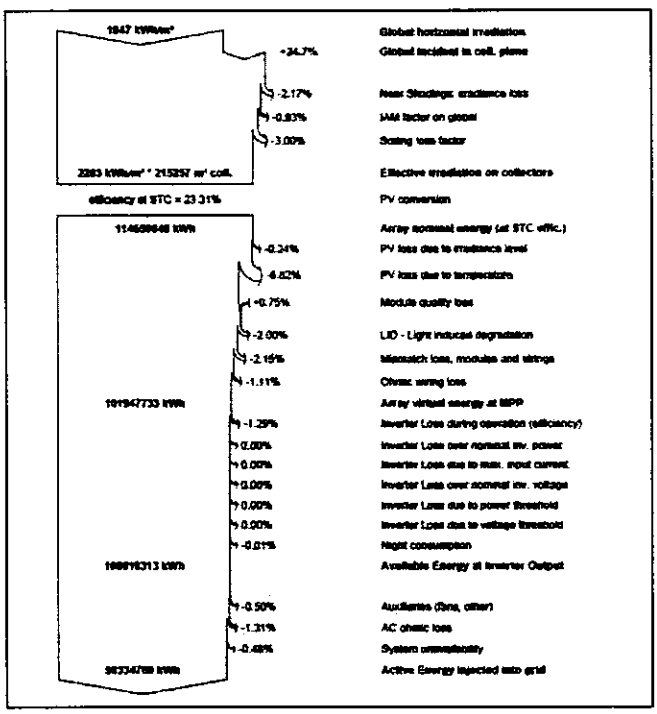


Figure 26 Loss Diagram on Meteornorm with Mono-Perc Modules

2.2 Energy yield simulation for most suitable technical design

Different pre-assessments have been calculated with the simulation software PVSyst. PVSyst takes as an input, the meteorological data as well as a given system design and a component selection. Then it simulates a whole operational year in two-minutes-steps through a whole year.

The options for technical design are single axis tracking with minimum tilt of -60 to a maximum tilt of 60. The first high level yield assessments show following initial annual output to grid at P50 level. The results (see) are calculated for the interconnection point with the HV grid.

The results include cable losses to the point of interconnection to the HV Power line.

Table 9: Summarized Main Results of Yield Simulation
(Please see plot of main results in Appendix 1)

Feature				
Irradiation in module plane [kWh/m²/year]	**1947.0**	**1947.0**	**2034.8**	**2034.8**
Performance Ratio (PR) [%]	81.0	84.3	80.3	83.8
Initial specific output [kWh/kWp]	**1967**	**2047**	**2005**	**2091**
Total output for 50 MWp [MWh/year]	98,334	102,322	100,257	104,535

2.2.1 Risk mitigation

All the risks on the energy output can be controlled, except for the meteorological uncertainties. We strongly recommend to contractually specifying each qualitative relevant detail in the EPC and O&M contract. This includes the quality criteria, how they are to be measured for the single PV plants and the consequence if they are not met.

This point is most valid for the PV modules and inverters. To enforce the deliverables, a financial security should be in place for a minimum of two years, preferably five years.

The meteorological uncertainties have to be considered in the financial model, which needs to have the flexibility to cater for those.

APPENDIX 1: PVSyst Simulation

APPENDIX 2: Geotechnical Investigation Report

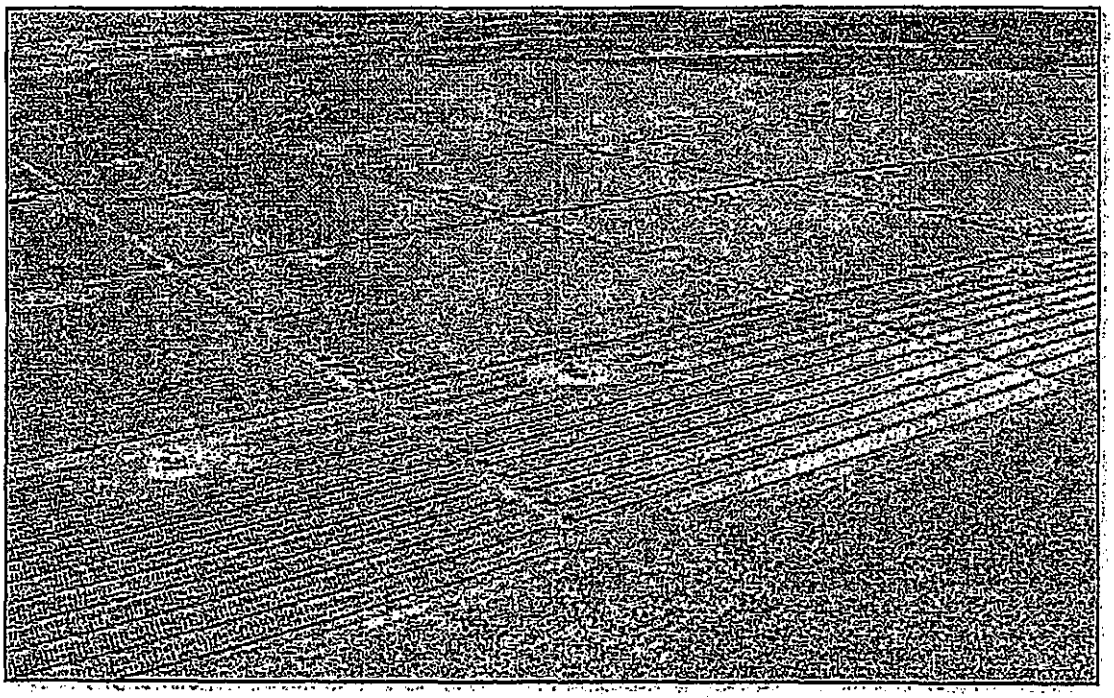
ANNEXURE – J
BER SUBMITTED BY KE TO NEPRA

RAD

BID EVALUATION REPORT

100 MWp SOLAR POWER PROJECT AT BELA – BALOCHISTAN – PAKISTAN ("PROJECT")

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



AUGUST 2024

Table of Contents

Executive Summary

Project Background

K-Electric Limited ("KE") initiated the process of bidding to induct 100 MW Solar Project in Balochistan region under NEPRA Competitive Bidding Tariff (Approval Procedure) Regulations, 2017. 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 through to KE grid through the 132kV HVUB transmission line.

Open Competitive Bidding

KE conducted the initial prequalification process for the Project in 2021. Subsequently, the Request for Proposal ("RFP") for the Projects were approved by NEPRA on February 29, 2024, under open competitive bidding without benchmark tariff. 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 31st July 2024 (**"Bid Submission Deadline"**).

Power Evacuation arrangement

It is pertinent to mention here that evacuation of power from the Project is dependent on timely completion of HVUB Grid and Transmission Line for which KE humbly requests the Honorable NEPRA Authority to approve the cost based on competitive bids received so that EPC Contract can be awarded for construction of the HVUB Grid and Transmission Line for timely evacuation of power from the Project.

Submission of Bids and Evaluation of Technical Proposals

In response to KE invitation, eight (08) Bidders participated in the open competitive bidding procedure and their technical bids for the Project were opened on August 1, 2024.

After a thorough technical evaluation, it was concluded that all the Bidders met the knock-off criteria and achieved more than the minimum technical score. The list of Technically qualified Bidders is as follows.

S. No.	Lead Sponsor
1	Atlas Power Limited
2	Hecate Global Renewables LLC
3	Hub Power Holdings Limited
4	JCM Power Corporation
5	Master Textile Mills Limited
6	Metro Group of Companies
7	Oursun Pakistan Limited
8	Sapphire Electric Company Limited

Table 1: List of Technically qualified Bidders

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Evaluation of Commercial Proposals

Subsequent to technical evaluation, financial bids were opened for all the Technically qualified Bidders on August 19, 2024. The summary of tariff proposal submitted by all the Bidders are as follows:

Lead Sponsor Name	Bid Tariff (PKR/kWh)	Ranking
Master Textile Mills Limited	11.2071	1
Atlas Power Limited	12.1766	2
JCM Power Corporation	12.3057	3
Metro Group of Companies	12.3900	4
Hub Power Holdings Limited	12.8449	5
Oursun Pakistan Limited	13.5088	6
Hecate Global Renewables LLC	15.8757	7
Sapphire Electric Company Limited	16.6000	8

Table 2: Summary of Tariff Proposal

Prudency Check by KE

As directed by NEPRA in its determination of RFP of the Project, 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. 11.5186/kWh – Rs.12.7634/kWh (USc.3.9906/kWh – USc.4.4218/kWh) depending upon the mix of foreign and local debt. However, as evident from Table 2 above, the lowest Bidder - Master Textiles Mills Limited has offered a tariff of Rs. 11.2071/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 1,569 million (total savings of PKR 39.23 billion 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 11.25 million (total savings of USD 281 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, **Master Textile Mills Limited 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 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 license 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 Winder, and Bela towns are located in the Lasbela district of Balochistan which falls under KE distribution territory. The existing transmission network from Winder to Bela is 66 kV which is planned to be replaced with new transmission lines and grids of 132 kV. The investment required for this upgradation is currently under review with NEPRA for approval. The 132 kV transmission system is planned to be energise before each Project's COD, subject to regulatory approvals.

1.3 KE conducted the initial prequalification process for the Projects in 2021.

1.4 In accordance with NEPRA's determination dated February 29, 2024, the prequalification process was conducted again. Moreover, NEPRA had clarified that the existing prequalified parties were considered as prequalified.

1.5 The RFP of the Project was structured in line with the laws of Pakistan, International standards and bankability. The approval of RFP document for the Projects was accorded by NEPRA vide its decision no. NEPRA/Advisor (CTBCM)/RFP-04/3115-21 on February 29, 2024.

1.6 The invitation to bid advertisement for the Project(s) was published on 2nd April 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

1.7 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.

1.8 In line with the RFP, KE formed the Bid Evaluation Committee (as detailed in Section 2 below) to oversee the Competitive Bidding process, evaluation of Bids and preparation of Bid Evaluation Report.

1.9 As required under NCBTR, KE appointed M/s OMS (Private) Limited ("OMS") as Independent Consultant ("IC") in the Bid Evaluation Committee of the Project.

2 Evaluation of Bids

2.1 Bid Evaluation Committee

In compliance with NEPRA Competitive Bidding Tariff Regulations, 2017 ("NCBTR"), KE formed the Bid Evaluation Committee 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 Consultant

Table 2.1-1: Bid Evaluation Committee Members

The Bid Evaluation Committee has assessed both the Technical and Financial/Tariff Proposal received, and subsequently conducted 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 Bid Evaluation Committee as required under the NCBTR, 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 pertinent to mention here that evacuation of power from the Project is dependent on timely completion of HVUB Grid and Transmission Line for which KE humbly requests the Honorable NEPRA Authority to approve the cost based on competitive bids received so that EPC Contract can be awarded for construction of the HVUB Grid and Transmission Line for timely evacuation of power from the Project.

Grid Interconnection study had already been conducted for the project and the same has already been shared with the bidders.

2.3 Bidding Process

2.3.1 Prequalification

A prequalification process was initially carried out by KE in 2021, however in the recent 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 have already been prequalified by KE shall not be required to go through the process again. The following parties were pre-qualified in the initial round of 2021.

S. No.	Lead Sponsor	Status
1	China Machinery Engineering Corporation (CMEC)	Single Entity
2	Trina Solar Company Limited	Single Entity
3	Master Textile Mills Limited (MTML)	Consortium
4	Oursun Pakistan Limited	Consortium
5	Rana Nasim - Gharo Solar (Private) Limited	Consortium

6	Marubeni Corporation	Consortium
7	Sapphire Electric Company Limited	Consortium
8	Atlas Power Limited	Single Entity
9	Ib vogt GmbH	Single Entity
10	Metro Group of Companies	Consortium
11	Zorlu Energy	Single Entity
12	Universal Energy Company Limited	Consortium
13	JCM Power	Consortium
14	Engro Energy Limited	Single Entity
15	Zonergy Company Limited	Single Entity
16	Artistic Milliners (Private) Limited	Single Entity
17	Scatec Solar	Consortium
18	Malaysian Solar MSR	Consortium
19	Hecate Energy	Consortium
20	JA Solar Holdings	Single Entity

Table 2.3-1: List of prequalified bidders

Subsequently, new bidders and the parties who have changed the consortium submitted prequalification documents along with their bidding documents.

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 bidders by KE on July 23, 2024, and July 26, 2024. Moreover, KE issued General Clarifications (Refer Annexure A2), Corrigendum to RFP (Refer Annexure A3) and shared Energy Purchase Agreement revision with Bidders (Refer Annexure A4).

2.3.3 Bid submission

At the time of Bid Submission Deadline on July 31, 2024, a total number of 08 (eight) Bids were received from the following Bidders:

S. No.	Bidder Name	Address	Single Entity/Consortium	Country
1	Atlas Power Limited	26/27 km, Lahore Sheikhupura Road, Sheikhupura	Single Entity	Pakistan
2	Hecate Global Renewables LLC (Lead Member) – Asia Petroleum Limited	621 W. Randolph St., Chicago, IL 60661, United States of America D-52, Block 4, Scheme 5, Clifton, Karachi	Consortium	USA Pakistan
3	Hub Power Holdings Limited	9th Floor, Ocean Tower Block-9, Main Clifton Road, Karachi	Single Entity	Pakistan
4	JCM Power Corporation (Lead Member) – Rana	15 Baycrest Drive, Barrie, CA, ON L4M 7C7	Consortium	Canada - Pakistan

	Nasim Ahmed (Support Member)	76-B, Street 4, Phase 5, DHA, Lahore, Pakistan		
5	Master Textile Mills Limited (Lead Member) – Mr. Nadeem Malik (Sponsor) – Mr. Shahzad Malik (Sponsor)	82-C1, Gulberg-III, Lahore	Consortium	Pakistan
6	Metro Group of Companies – Mr. Danish Iqbal (Sponsor) – Mr. Saad Iqbal (Sponsor) – Ms. Natasha Iqbal (Sponsor)	7th Floor, Al-Tijarah Centre, P.E.C.H.S., Main Shahrah-e-Faisal, Karachi.	Consortium	Pakistan
7	Oursun Pakistan Limited – Orient Power Company Private Limited	10 Ali Block, New Garden Town, Lahore – Pakistan	Consortium	Pakistan
8	Sapphire Electric Company Limited – Sapphire Fibres Limited – Ningbo Green Light Energy Pvt. Ltd.	7-A/K, Main Boulevard, Gulberg-II, Lahore – Pakistan 2nd Floor, Pace Mall, 96-B1, MM Alam Road, Gulberg III, Lahore	Consortium	Pakistan

Table 2.3-2: List of bids received

2.3.4 Evaluation of Prequalification Application upon bid submission

In accordance with the KE RFP, three (3) Prequalified Applicants in the initial round namely, JCM Power Corporation, Metro Group of Companies and Hecate Energy, submitted the request for change in their consortium.

Furthermore, Hub Power Holdings 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 new parties were prequalified for the Project.

S.No.	Lead Member	Status
1	JCM Power Corporation	Consortium
2	Hub Power Holdings Limited	Single Entity
3	Hecate Global Renewables LLC	Consortium
4	Metro Group of Companies - Mr. Danish Iqbal	Consortium

Table 2.3-3: List of fresh prequalified bidders

2.3.5 Technical Evaluation Criteria:

Given below are the technical specifications relevant to technology and energy yield of the solar power plant, non-compliance to which shall result in disqualification of the bidder.

Knock-off Criteria:

Solar Panel:	Tier 1
Yield:	Greater than 21.5%
Grid Code:	Compatibility of the Complex and equipment with technical standards of Grid Code 2023 (power factor, voltage variation, operating frequency range etc.), Distribution Code and other applicable documents etc.

Detailed Technical Scorecard is given in annexure A5, according to which, minimum criteria for qualification of bidder are 75 out of 100 marks after passing the knock-off criteria.

2.3.6 Technical Evaluation Summary

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

Technical Evaluation Criteria	Atlas Power Limited	Hecate Global Renewables LLC	Hub Power Holdings Limited	JCM Power Corporation	Master Textile Millst Limited	Metro Group of Companies	Oursun Pakistan Limited	Sapphire Electric Company Limited
Compliant with Knock off Criteria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Solar Panel	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power Inverter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GIS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power Transformer & Other Switchgear equipment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SCADA, Tele-communication and Protection Schemes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Metering System & Back-up Metering System	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weather Station	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Civil / Mounting Structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BOP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safety & Security	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Plant Monitoring System	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interconnection Requirement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Design Experience and Capability	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yield	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
O&M	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HSE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.3-4: Technical Submission Summary Results (detailed technical scoring card in annexure A5)
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:

a) Bid Submission Letter
b) Confidentiality Agreement
c) Form of Covenant

d) Power of Attorney
e) Affidavit
f) Letter of Acceptance
g) Form of Bid Bond

All the bidders are considered to have submitted a compliant legal submission.

Lead Sponsor	Bid Submission Letter	Confidentiality Agreement	Form of Consent	Power of Attorney	Affidavit	Letter of Acceptance	Form of Bid Bond
Atlas Power Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hecate Global Renewables LLC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hub Power Holdings Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
JCM Power Corporation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Master Textile Mills Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Metro Group of Companies – Mr. Danish Iqbal	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oursun Pakistan Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sapphire Electric Company Limited	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.3-5: 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 seven (7) 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 as all Bidders were declared technically qualified.

3 Evaluation of Bid Tariff

The financial bid opening took place on August 19, 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	Bid Tariff (PKR/kWh)	Ranking
Master Textile Mills Limited	11.2071	1
Atlas Power Limited	12.1766	2
JCM Power Corporation	12.3057	3
Metro Group of Companies – Mr. Danish Iqbal	12.3900	4
Hub Power Holdings Limited	12.8449	5
Oursun Pakistan Limited	13.5088	6
Hecate Global Renewables LLC	15.8757	7
Sapphire Electric Company Limited	16.6000	8

Table 3-1: Bid Tariff of technically qualified bidders

Furthermore, it is pertinent to mention that all Bidders have submitted their proposal based on commercial financing and have asserted that SBP concessionary financing is not available. Additionally, they have also submitted relevant correspondence from Local Banks confirming the non-availability of SBP's concessionary financing arrangement.

In conclusion, based on the evaluation criteria as mentioned in Exhibit -7 of the RFP, the Bidder offering the lowest Bid Tariff is **Master Textile Mills Limited**, with a Bid Tariff of **11.2071 PKR/kWh (USc. 3.8826/kWh)**[1].

[1] 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 performed.

4.1 Prudency of Bid Tariff

KE has performed an analysis of submitted tariffs based on the prevailing equipment costs (based on quotes received from equipment manufacturers) and 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% + 4.5%
Foreign Debt Tenor	15 years
KIBOR + Spread	21.28% + 2.5%
Local Debt Tenor	15 years
Capacity Factor	23%
Debt: Equity Ratio	70:30
Return on Equity	15% (USD Based)
IRR	13%
EPC Cost	USD 0.48 Mn/MW[2]

Table 4.1-1: Assumptions

Range of Bid Tariff upon KE independent assessment	
PKR 11.5186/kWh	PKR 12.7634/kWh
Foreign Debt Mix – 100%	Foreign Debt Mix – 80%
Local Debt Mix – Nil	Local Debt Mix – 20%

Table 4.1-2: Estimated bid tariff

4.2 Displacement Cost Analysis[3]

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	1,569 Mn	39,232 Mn
Forex Savings - USD	11.25 Mn	281.2 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

[2] KE had gathered quotations from different equipment manufacturers and service providers to evaluate the prudency of successful bid.[3] Savings due to displacement of imported fuel has been worked out using prevalent fuel cost considering horizon of 3 years, which have then been prorated over entire Project Life.

[3] Savings due to displacement of imported fuel has been worked out using prevalent fuel cost considering horizon of 3 years, which have then been prorated over entire Project Life.

supply from National Grid (assumed at 1,700 MW for the analysis), fuel prices, marginal cost of National Grid, technical constraints etc.

5 Conclusion

Based on the Technical and Financial evaluation conducted by the Bid Evaluation Committee, 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 Master Textile Mills Limited (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 NEPRA approved RFP.

The Bid Evaluation Committee hereby approves the Bid Evaluation Report and declares **M/s Master Textile Mills Limited** as the Successful Bidder, subject to approval of NEPRA.

Head of Business Development – KE

Head of Business Finance – KE

Head of Legal – KE

Head of Procurement – KE

Independent Consultant – OMS (Private) Limited

ANNEXURES

A1 – Bid Details for Master Textile Mills Ltd.

S. No.	Description	Specifications
1	Solar Panel	Longi Himo 9 (LR7-72HYD), Longi Himo 7 (LR7-72HGD), Trina Vertex N (N-type i-TOPCon)
2	Power Inverters	Sungrow SG8800UD-MV-20, Huawei
3	Gas Insulated Switchgear (GIS)	TBEA ZF53-145 SF6-GIS, Chint
4	Power Transformers	TBEA SFZ11 SFZ-100000/132, Chint
5	SCADA System	EBOP SCADA
6	Overall System Design and Documentation	Detailed design provided
7	Experience of Key Design Staff	Master team and RE2
8	Tracking System	Trina Venguard 1P, HD Solar, ANTAI
9	Warranty duration and coverage for solar panels	12 year material and processing, 30 year linear power output
10	Warranty duration and coverage for inverters	5 years
11	Warranty duration and coverage for GIS	2 years
12	Warranty duration and coverage for power and inverter transformers	Inverter Transformer: 5 years, Power Transformer: 2 years
13	CSR	Compliance

ANNEXURE – K
BER APPROVAL

Nayab rishi

From: Mairah Khan <mairah.khan@ke.com.pk>
Sent: Thursday, March 27, 2025 1:33 PM
To: Zainab Saleem; Rumman A. Dar; New Projects
Cc: Mudassir Zuberi; Ayesha Akhtar; Fahad Mazhar; Fahad Najmi; Huzaifa Abdul Samad
Subject: FW: Bid Evaluation Report (BER) For 50MWp Winder and 100MWp Bela Solar Projects at Balochistan - Submission of Tariff Petition

Dear Master Team,

Reference to the below email, please submit the tariff petition for the projects with NEPRA as soon as possible.

Regards,
Mairah Khan

From: Registrar <registrar@nepra.org.pk>
Sent: Tuesday, 25 March 2025 4:41 pm
To: Moonis Abdullah Alvi, Syed <moonis.alvi@ke.com.pk>
Cc: Sameer Hasan, Syed <sameer.hasan@ke.com.pk>; Chairman <chairman@nepra.org.pk>; Syed Salman Rehman <salman@nepra.org.pk>; Gul Hassan Bhutto <bhutto.gulhassan@nepra.org.pk>; Ather Rehman <atherrehman@nepra.org.pk>; Mian Ahmad Ibrahim <ahmad.ibrahim@nepra.org.pk>; Noor Saleem <noorsaleem@nepra.org.pk>; Saba Saif <sabasaif@nepra.org.pk>; Hassan Bhinder <hassan.bhinder@nepra.org.pk>
Subject: Bid Evaluation Report (BER) For 50MWp Winder and 100MWp Bela Solar Projects at Balochistan - Submission of Tariff Petition

[External Sender registrar@nepra.org.pk]

It is submitted that the Authority has approved the subject Bid Evaluation Report (BER) 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 March 31, 2025 as informed by KE, KE is being informed to direct the lowest evaluated bidders to file their tariff petitions before NEPRA, as per the relevant provisions of NEPRA Competitive Bidding Tariff Regulations-2017 (NCBTR).

Wasim Anwar Bhinder

Registrar,

NEPRA

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ANNEXURE – L
O&M MANUAL

Operations and Maintenance

In accordance with the requirements outlined in Section 15.17 Volume II of the RFP; MSEL, as the Project Developer, will strive to ensure the operational efficiency of the Project and will be responsible for the O&M of the entire solar PV plant at each location. The scope of our responsibilities includes:

- Module cleaning
- Module connection integrity
- Junction boxes/combiners inspection
- Thermographic detection of faults
- Inverter servicing
- Mechanical integrity of the mounting structure
- Vegetation control
- Routine balance of plant servicing/inspection
- Cable connection tightening/replacement of blown fuses
- Lightning damage repair
- Mounting structure/tracking system fault repair
- Optimizing loss due to soiling
- Providing additional points for automated cleaning mechanisms
- Rectifying SCADA faults

Additionally, the Project Developer will:

1. Be responsible for claiming any warranties or replacements that might arise during the life of the plant.
2. Ensure operations to maintain availability as per the proposed Capacity Factor.
3. Be responsible for array inspection and cleaning to maintain the required performance target, as well as inspecting the inverter and rectifying faults to ensure plant availability.

Based on the site survey, we believe that certain technical measures will need to be undertaken according to site specifics to ensure efficient plant operations. Further evaluation of the site conditions, detailed studies, and observations from our technical consultant, along with subsequent approvals from KE and NEPRA, will guide the development of our O&M strategies for the Project's benefit.

ANNEXURE – M
K-ELECTRIC LETTER TO MASTER TEXTILE MILLS LIMITED

Private and Confidential
Without Prejudice

Reference No. BD/SQK/MT-WBB/01/2024-2308
August 23, 2024

Mr. Rumman A. Dar
Director – New Business Development
Master Textile Mills Limited
82 C-1, Gulberg III,
Lahore

Subject: **Lowest Tariff Bid for 150 MW Solar Projects at Winder and Bela (the "Projects")**

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 Proposals ("**RFP**"), **Master Textile Mills Limited ("MTML")** has successfully cleared the technical evaluation and submitted the lowest bid tariff for the Projects.

The Projects carry great importance for KE as they are the first of its kind competitive bidding projects in Pakistan and a pivotal step towards KE's commitment for affordable and reliable power.

Please note that this letter is confidential and being issued without prejudice for the sole purpose of initiating the preliminary requirements of MTML 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.

Sincerely,

Shahab Qader Khan
Chief Strategy Officer