Reon

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

Subject: Application for Generation License

I, Mujtaba Haider Khan, Chief Executive Officer, being the duly authorized representative of REON ALPHA (PRIVATE) LIMITED by virtue of BOARD RESOLUTION dated (31st October 2017), hereby apply to National Electric Power Regulatory Authority for the grant of a Generation License to REON ALPHA (PRIVATE) LIMITED pursuant to section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997.

I certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, and undertake to abide by the terms and provisions of the above-said regulations. 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 belief.

A PAY ORDER in the sum of Rupees 151,336, being the non-refundable license application fee calculated in accordance with Schedule II to the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, is also attached herewith.

Date: 03/11/17

REON ALPHA (PRIVATE) LIMITED Reon Alpha

Mujtaba Haider Khan
Chief Executive Officer

Reon Alpha (Private) Limited
Floor, Dawood Center, M.T. Khan Road, Karachi- 75530, Pakistan. Tel: +92 21 3563 2200-09 Fax: +92 21 3563 3970
Office: 3rd Floor, Asia House, 19-C/D, L Block, Gulberg III, Main Ferozpur Road, Lahore- 54660, Pakistan.
Tel: +92 42 3586 1050-53 Fax: +92 42 3586 1054
UAN: 111 736 611 Website: www.reonenergy.com Email: info@reonenergy.com

REON ALPHA (PRIVATE) LIMITED

Extract of the Board of Directors Resolution
Held on October 31, 2017

I, Imran Chagani, Company Secretary of Reon Alpha (Private) Limited, hereby certify that the following Resolution was passed by the Board of Directors on October 31, 2017.

> **"RESOLVED that** the Company shall proceed with all acts necessary to comply with the legal and regulatory requirements in relation to its business objects and activities.
>
> **FURTHER RESOLVED that** Mr. Mujtaba Haider Khan, Chief Executive Officer has been duly authorized in file; (i) an application for grant of Generation License; (ii) any other clarification submission application petition or document in support thereof; (iii) to make any oral or written representations on behalf of the Company before the National Electric Power Regulatory Authority and any other body, organization, department judicial and quasi-judicial body in relation to the aforesaid filings and to do all other acts, deeds, things and matters as may be deemed expedient in giving effect to the aforesaid resolution.
>
> **FURTHER RESOLVED that** Mr. Mujtaba Haider Khan, Chief Executive Officer may further delegate the aforesaid powers, in writing, to one or more persons, as deemed expedient from time to time."

Certified True Copy

REON ALPHA (PRIVATE) LIMITED
Reon Alpha
KARACHI

Imran Chagani
Company Secretary

Dated: October 31, 2017

A033217

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

SECP

COMPANY REGISTRATION OFFICE, KARACHI

CERTIFICATE OF INCORPORATION

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

Corporate Universal Identification No. **0112696**

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

Given under my hand at **Karachi** this **Twenty Third** day of **October, Two Thousand** and **Seventeen**.

Incorporation fee Rs. **460,500/=**

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

(Kashif Mahmood)
Deputy Registrar of Companies

Certified to be True Copy
24/10/17
Deputy Registrar of Companies
Date:

REON ALPHA (PRIVATE) LIMITED
Reon
Director

FREE OF COST COPY

ANNEXURE – 4

3(5)(a)(ii) Certified Copies of Memorandum and articles of association

(Certified by SECP)

REON ALPHA (PRIVATE) LIMITED
Reon Alpha
KARACHI

LPHA (PRIVATE)

THE COMPANIES ACT, 2017 (XIX of 2017)

(COMPANY LIMITED BY SHARES)

MEMORANDUM

OF

ASSOCIATION

OF

REON ALPHA (PRIVATE) LIMITED

THE COMPANIES ACT, 2017 (XIX of 2017)

(COMPANY LIMITED BY SHARES)

MEMORANDUM OF ASSOCIATION

OF

"REON ALPHA (PRIVATE) LIMITED".

1. The name of the company is Reon Alpha (Private) Limited.

2. The registered office of the Company will be situated in Sindh

3. (i) The principal line of business of the Company shall be own and operate electrical power generation project inter-alia involving of generating, purchasing, importing, transforming, converting, distributing, supplying, exporting and dealing in electricity and to perform all other acts which are necessary or incidental to such business.

(ii) Except for the businesses mentioned in sub-clause (iii) hereunder, the company may engage in all the lawful businesses and shall be authorized to take all necessary steps and actions in connection therewith and ancillary thereto.

(iii) Notwithstanding anything contained in the foregoing sub-clauses of this clause nothing contained herein shall be construed as empowering the Company to undertake or indulge, directly or indirectly in the business of a Banking Company, Non-banking Finance Company (Mutual Fund, Leasing, Investment Company, Investment Advisor, Real Estate Investment Trust management company, Housing Finance Company, Venture Capital Company, Discounting Services, Microfinance or Microcredit business), Insurance Business, *Modaraba* management company, Stock Brokerage business, forex, real estate business, managing agency, business of providing the services of security guards or any other business restricted under any law for the time being in force or as may be specified by the Commission.

(iv) It is hereby undertaken that the company shall not:

(a) engage in any of the business mentioned in sub-clause (iii) above or any unlawful operation;

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

(b) launch multi-level marketing (MLM), Pyramid and Ponzi Schemes, or other related activities/businesses or any lottery business;

(c) engage in any of the permissible business unless the requisite approval, permission, consent or licence is obtained from competent authority as may be required under any law for the time being in force.

4. The liability of the members is limited.

5. The authorized capital of the company is Rs. 110,000,000 (Rupees One Hundred and Ten Million only) divided into 11,000,000 (Eleven Million) ordinary shares of Rs. 10/- (Rupees Ten only) each.

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

Name and surname (present & former) in full (in Block Letters)	NIC No. (in case of foreigner, Passport No)	Father's/ Husband's Name in full	Nationality (ies) with any former Nationality	Occupation	Usual residential address in full or the registered/ principal office address for a subscriber other than natural person	Number of shares taken by each subscriber (in figures and words)	Signatures
Dawood Lawrencepur Limited Through	0000441	Subscriber	Pakistani		Dawood Centre. M.T. Khan Road, Karachi	98 (Ninety Eight)	
Shahid Hamid Pracha	42301-7734356-7	Abdul Hamid Pracha	Pakistani	Services	House No 16-B, 3rd Central Lane, Phase 2, DHA, Karachi South		
Mujtaba Haider Khan	42201-0492212-1	Ansar Haider Khan	Pakistani	Services	Bhayani Sunview, Gulshan-e-Iqbal, H No 124 Block 11 Karachi Central Pakistan	01 (One Share)	
Shafiq Ahmed	42201-0589388-3	Muhammad Sadiq	Pakistani	Services	House No G-84, Block 6, PECHS, Karachi, East	01 (One Share)	
		Total number of shares taken (in figures and words)				100 (Hundred Shares)	

Dated the 11th day of October, 2017

Certified to be True Copy
Deputy Registrar of Companies

FREE OF COST

REON ALPHA (PRIVATE) LIMITED KARACHI

THE COMPANIES ACT, 2017 (XIX of 2017)

(Company Limited by Shares)

ARTICLES OF ASSOCIATION

OF

REON ALPHA (PRIVATE) LIMITED

PRELIMINARY

1. (1) In these regulations-

(a) "section" means section of the Act;

(b) "the Act" means the Companies Act, 2017; and

(c) "the seal" means the common seal or official seal of the company as the case may be.

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

BUSINESS

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

SHARES

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

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

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

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

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

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

TRANSFER AND TRANSMISSION OF SHARES

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

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

Form for Transfer of Shares

(First Schedule to the Companies Act, 2017)

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

Signature	Signature .....
Transferor	**Transferee**
Full Name, Father's / Husband's Name	Full Name, Father's / Husband's Name
CNIC Number (in case of foreigner, Passport Number)	CNIC Number (in case of foreigner, Passport Number)
Nationality	Nationality
Occupation and usual Residential Address	Occupation and usual Residential Address
	Cell number
	Landline number, if any
	Email address

Witness 1:	**Witness 2:**
Signature.....date	Signature.....date .....
Name, CNIC Number and Full Address	Name, CNIC Number and Full Address

REON ALPHA (PRIVATE) LIMITED ★ KARACHI ★ Reon Alpha

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

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

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

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

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

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

a) a fee not exceeding fifty rupees as may be determined by the directors is paid to thecompany in respect thereof; and

b) the duly stamped instrument of transfer is accompanied by the certificate of the shares to which it relates, and such other evidence as the directors may reasonably require to show the right of the transferor to make the transfer.

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

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

TRANSMISSION OF SHARES

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

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

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

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

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

14. A person to be deemed as a member under regulation 11, 12 and 13 to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he were the registered holder of the share and exercise any right conferred by membership in relation to meetings of the company.

ALTERATION OF CAPITAL

15. The company may, by special resolution-

(a) increase its authorised capital by such amount as it thinks expedient;

(b) consolidate and divide the whole or any part of its share capital into shares of larger amount than its existing shares;

(c) sub-divide its shares, or any of them, into shares of smaller amount than is fixed by the memorandum;

(d) cancel shares which, at the date of the passing of the resolution in that behalf, have not been taken or agreed to be taken by any person, and diminish the amount of its share capital by the amount of the share so cancelled.

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

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

17. 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.

18. The company may, by special resolution-

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

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

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

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

GENERAL MEETINGS

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

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

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

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

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

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

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

NOTICE AND PROCEEDINGS OF GENERAL MEETINGS

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

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

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

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

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

28. 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.

29. 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.

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

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

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

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

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

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

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

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

35. 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.

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

VOTES OF MEMBERS

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

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

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

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

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

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

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

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

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

INSTRUMENT OF PROXY

Reon Alpha (Private) Limited

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

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

DIRECTORS

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

1.Mr. Mujtaba Haider Khan

2. Mr. Shafiq Ahmed

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

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

POWERS AND DUTIES OF DIRECTORS

REON ALPHA (PRIVATE) LIMITED Reon Alpha KARACHI

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

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

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

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

MINUTE BOOKS

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

(a) all resolutions and proceedings of general meeting(s) and the meeting(s) of directors and Committee(s) of directors, and every member present at any general meeting and every director present at any meeting of directors or Committee of directors shall put his signature in a book to be kept for that purpose;

(b) recording the names of the persons present at each meeting of the directors and of any committee of the directors, and the general meeting; and

(c) all orders made by the directors and Committee(s) of directors:

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

THE SEAL

52. The directors shall provide for the safe custody of the seal and the seal shall not be affixed to any instrument except by the authority of a resolution of the board of directors or by a co

of directors authorized in that behalf by the directors and in the presence of at least two directors and of the secretary or such other person as the directors may appoint for the purpose; and those two directors and secretary or other person as aforesaid shall sign every instrument to which the seal of the company is so affixed in their presence.

DISQUALIFICATION OF DIRECTORS

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

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

PROCEEDINGS OF DIRECTORS

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

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

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

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

58. 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.

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

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

60. 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.

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

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

FILLING OF VACANCIES

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

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

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

66. 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.

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

DIVIDENDS AND RESERVE

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

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

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

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

72. 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.

73. (1) The directors may, before recommending any dividend, set aside out of the profits of the company such sums as they think proper as a reserve or reserves which shall, at the discretion of

the directors, be applicable for meeting contingencies, or for equalizing dividends, or for any other purpose to which the profits of the company may be properly applied, and pending such application may, at the like discretion, either be employed in the business of company or be invested in such investments (other than shares of the company) as the directors may, subject to the provisions of the Act, from time to time think fit.

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

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

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

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

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

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

ACCOUNTS

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

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

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

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

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

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

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

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

NOTICES

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

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

86. 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.

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

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

WINDING UP

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

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

(3) The liquidator may, with the like sanction, vest the whole or any part of such assets in trustees upon such trusts 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

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

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

Name and surname (present & former) in full (in Block Letters)	NIC No. (in case of foreigner, Passport No)	Father's/ Husband's Name in full	Nationality (ies) with any former Nationality	Occupation	Usual residential address in full or the registered/ principal office address for a subscriber other than natural person	Number of shares taken by each subscriber (in figures and words)	Signatures
Dawood Lawrencepur Limited Through Shahid Hamid Pracha	0000441 42301-7734356-7	Subscriber Abdul Hamid Pracha	Pakistani Pakistani	 Services	Dawood Centre. M.T. Khan Road, Karachi House No 16-B, 3rd Central Lane, Phase 2, DHA, Karachi South	98 (Ninety Eight)	
Mujtaba Haider Khan	42201-0492212-1	Ansar Haider Khan	Pakistani	Services	Bhayani Sunview, Gulshan-e-Iqbal, H No 124 Block 11 Karachi Central Pakistan	01 (One Share)	
Shafiq Ahmed	42201-0589388-3	Muhammad Sadiq	Pakistani	Services	House No G-84, Block 6, PECHS, Karachi, East	01 (One Share)	
		Total number of shares taken (in figures and words)				100 (Hundred Shares)	

Dated the 11th day of October, 2017

Certified to be True Copy
Deputy Registrar of Companies
Date: 24/10/17

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FREE OF COST COPY

Type, Technology, Model, Technical Details and Design of facility

- Polycrystalline 325W Solar Modules with efficiency 16.75% are used in the design
- 50 KW grid connected solar inverters, 400V three phase, 98.3% have been considered
- Step up Transformers 0.4 / 11KV ONAN are used
- Medium Voltage Switchgears 11KV / 630A
- System will be connected to 11KV Bus Bar of Diesel Generators
- DC/AC Ratio of 1.23 for Inverters has been considered
- Maximum AC output of the system is assumed to be 4050 KW
- Output of the system is based on instantaneous Irradiation values of Solar Energy
- 18 Acres of land area required for the installation of solar plant

Bill of Materials:

S. No.	Components	Qty (No.)
1	Polycrystalline Solar Modules 325W	15390
2	Grid Connected Solar Inverters 50KW 3 Phase	81
3	0.4 / 11KV Step up Transformers	5
4	Medium Voltage Switchgears	5
5	Diesel Gensets and Solar Energy Control System	1

Energy Generation:

S. No.	Efficiency Parameters	
1	Performance Ratio of the System	80.8%
2	Capacity Utilization Factor	17.9%
3	Energy Generation Units	7.85 Million KWh

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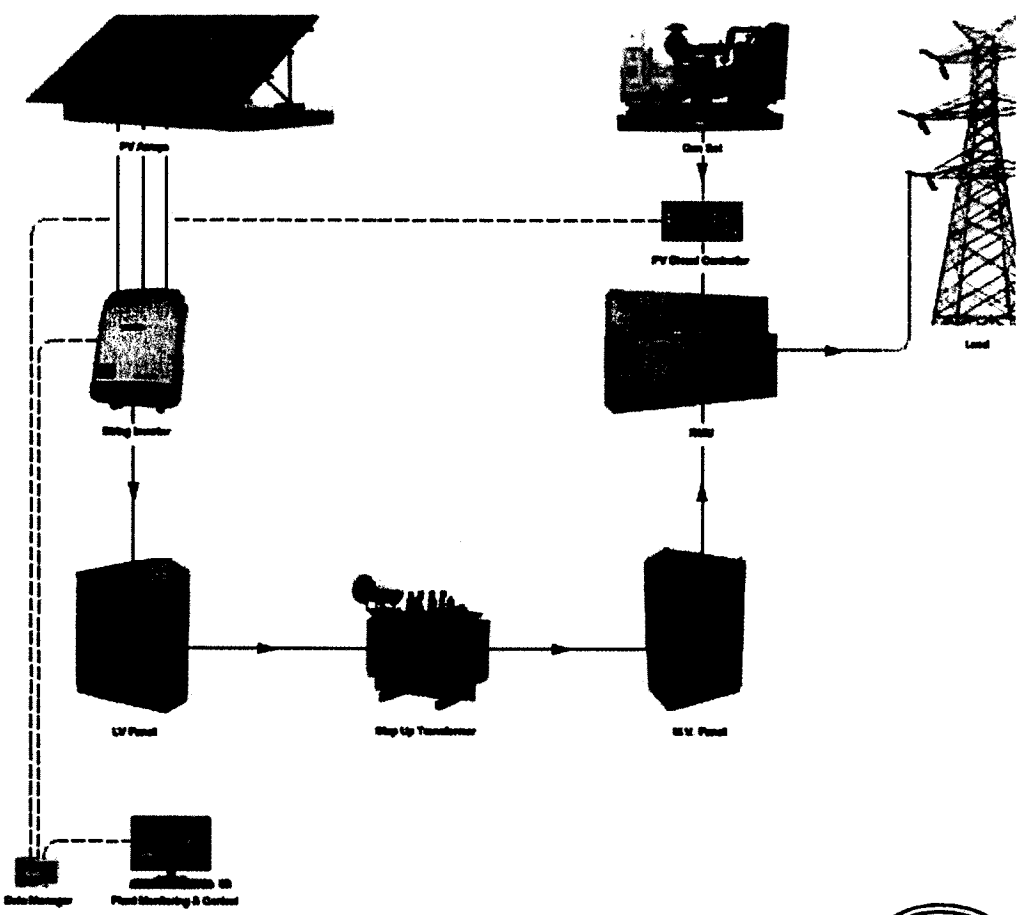
Technology used

S.No.	Parameters		Qty
1	Technology	Solar Photovoltaic (SPV)	
2	Size of Plant	5MW	
3	Solar Modules	Polycrystalline Solar Modules 325W Jinko or Tier 1 Equivalent	15390
4	Inverter	ABB Trio 50KW Grid Connected Inverter	81
5	Transformers	1000KVA 0.4 /11KV ONAN Transformers Siemens or Equivalent	5
6	Medium Voltage Switchgears	11KV 630 Amps 25KA Siemens or Equivalent	5

Conceptual Design



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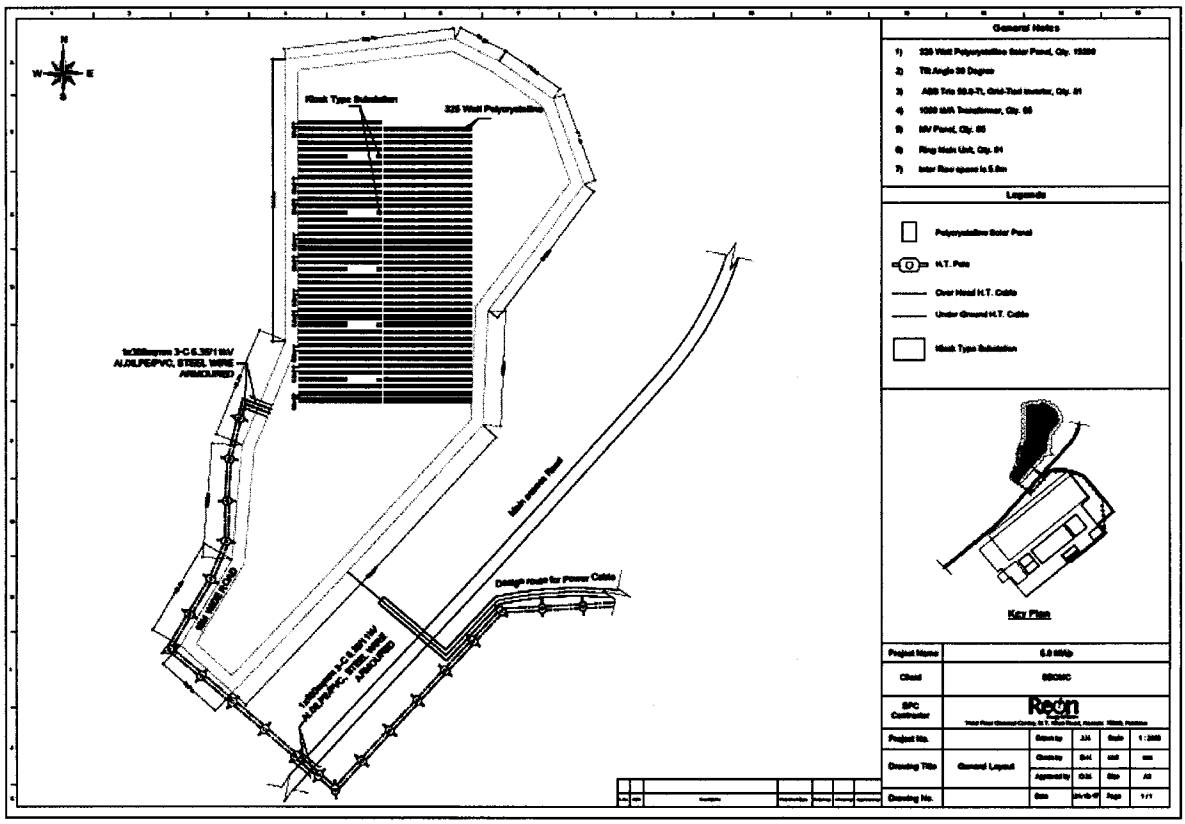
General Layout



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ANNEXURE – 15

3(5)(h) Feasibility Report

FEASIBILITY REPORT

SECMC 5MW Solar Power Plant

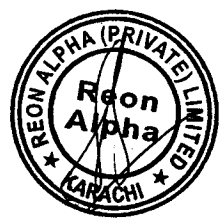
Executive Summary:

SECMC Solar Solution is a 5MW PV- Diesel Hybrid Power Plant which is to be installed near Mining Area of Sind Engro Coal Mining Company. The DC installed capacity of the plant is proposed by critically analyzing the current load and future load projections of the site. Main objective of this Solar plant is to provide smooth energy production from solar plant and keep generators to running above their minimum load threshold to avoid aging, thermal fatigue and over excitation of generators due to power flow through solar system.

Introduction:

This report has the objective to assess the feasibility of this project and is structured as follows:

- Introduction to Solar
- Solar Potential in Pakistan
- Project Overview
- Site Overview
- Conceptual Design
- Environmental Benefits
- Socio Economic Benefits
- Technical Summary



Introduction to Solar:

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system.

As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale solar power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun.

The productivity of solar power in a region depends on solar irradiance, which varies through the day and is influenced by latitude and climate.

The locations with highest annual solar irradiance lie in the arid tropics and subtropics. Deserts lying in low latitudes usually have few clouds, and can receive sunshine for more than ten hours a day. These hot deserts form the Global Sun Belt circling the world. This belt consists of extensive swathes of land in Northern Africa, Southern Africa, Southwest Asia, Middle East, and Australia, as well as the much smaller deserts of North and South America. Africa's eastern Sahara Desert, also known as the Libyan Desert, has been observed to be the sunniest place on Earth according to NASA.

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Solar Potential in Pakistan:

Increasing demand of power in the domestic, commercial and industrial sectors as Pakistan's population and its economy continue to expand—with annual GDP growth forecasts averaging 6 percent for the medium term. Currently, electricity consumption is severely suppressed by supply shortfalls and persistent load shedding, and there also exist significant levels of latent demand in the country as rising income levels allow more people to switch to electricity from using traditional fuels. The validity of the assumption that electricity use in Pakistan remains constrained due to availability—rather than access—issues is borne out by the fact that the penetration of the power network in the country is the highest in the South Asian region at 93.6 percent, as compared to 88.7 percent in Sri Lanka, 78.7 percent in India, 76.3 percent in Nepal, and 59.6 percent in Bangladesh.

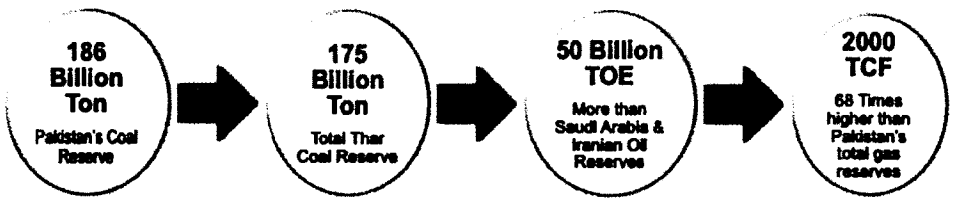
Pakistan's per capita electricity consumption is currently significantly lower in comparison to other countries in a similar development stage, and much below that of OECD countries. Per capita electricity consumption is strongly correlated with the human development index (HDI), and the current trends of rising incomes and energy supplies, falling poverty levels, and increasing economic activity are predicted to lead to rapid increases in per capita consumption rates in Pakistan, creating a healthy demand for additional power generation.

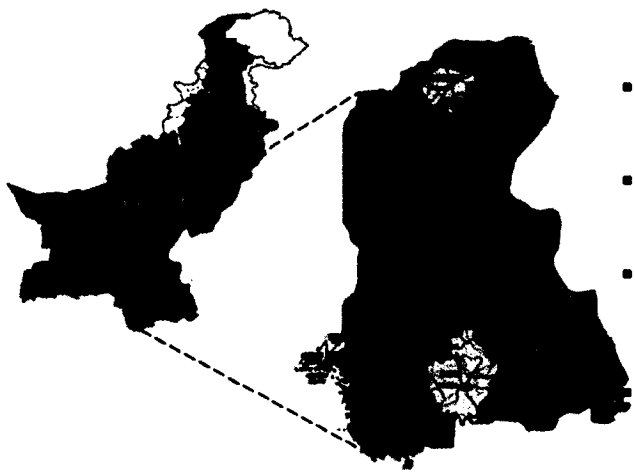
Even with the projected surplus in power generation capacity by 2020, there will still be sufficient economic feasibility for small and medium-sized (50-100 MW) renewable energy-based power projects in the Pakistan, especially those located near remote and isolated load centers and extremities of the grid network, or based on bilateral bulk contracts or for augmenting peak supplies on the grid. The viability of such projects will be further enhanced by the continued decline in technology prices and the emphasis by the government on indigenous energy resources that also help the country meet its environmental objectives and reduce carbon emissions.

Project Overview:

Sindh Engro Coal Mining Company Limited (SECMC) hereinafter referred to as the 'Owner' is a joint venture of Engro Powergen Limited & Affiliates and Government of Sindh. SECMC is working on the development of an Open Cast Lignite Mine and in Thar Block-II to support future energy needs of Pakistan. SECMC has been granted a 30 years Mining Lease for Thar Block-II by Mines & Minerals Development Department, Government of Sindh and has signed a Coal Supply Agreement in Thar Block II with Engro Powergen Thar (Pvt) Limited (EPTL) for supplying 3.8 mtpa coal for 30 years. EPTL is setting up a 2 x 330 MW Mine Mouth power plant. In addition, SECMC has also started work on the expansion of the mining capacity from current planned capacity of 3.8mpta.

Thar Desert contains the world's 7th largest coal reserves:





- Thar Lignite – 94% of Pakistan's Total Coal Reserves
- Total area 9,000 km² divided into 13 blocks
- Thar Block II has been allocated to SECMC which contains 2 Billion tons of Lignite
- 1.57 Billion tons are exploitable enough to produce 5,000 MW for 50 years!

SECMC will execute the project in three phases. The first phase of the Project is underway, in which, two 330 MW sub critical plants will be established with majority share of Engro Powergen.

In the second phase the mine will be further expanded to 7.6 MTPA and additional 2 x 330 MW will be added. Subsequently, the mine will be taken to its potential of approx. 23 MTPA capable of generating approx. 3,960 MW

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Project Rationale:

- During the earlier years the power requirement will be fulfilled by Diesel Generation.
- When the grid will be available, the energy mix will include diesel generation and grid power. The current power generation is not only expensive but also hedged to volatile global oil prices.
- The diesel fuel is an external resource for Thar and Pakistan which is expensive for its operation compared to solar power. The idea is to increase local indigenization.
- The Mining company requires Power primarily to supply electrical equipment such as coal handling system, MSF, Pumps, Lighting, Telecommunications, Water treatment system etc.
- Additionally the mine will require incremental power during expansion phase.

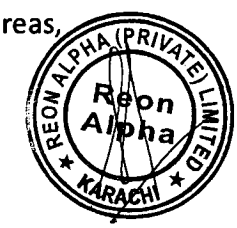
A Request for Proposal ("RFP") was floated for proposals for the 'Rental Power Generation from Solar Energy for Mining and Related Activities'.

The bidder shall procure, install, construct and operate Solar Power Generation facility for the nameplate capacity of 5 MW and SEMC will have the option to extend it during or after the Project and operate it for the period of 15 (fifteen) years and then hand over the operations to Company. The Company at its sole discretion may allow Bidder to continue O&M renewed on yearly basis for the period of further 10 (ten) years. Bidder will ensure Solar system has a warranty of atleast twenty-five (25) years and will provide the same to Company

DLL was awarded the project after coming the lowest in a competitive bidding. A project company REON Alpha (Pvt) Limited which is 100 % owned by DLL has been setup for this purpose.

Technology

- Solar based Power Generation System, civil structures and Auxiliaries.
- Complete Solar Based Power Generating Panels with their protection, instrumentation, monitoring, control and synchronizing panels with existing DG sets.
- 11kV Cables for interconnection with the 11kV Switchgear located in a separate building as shown in the drawings attached hereto as well as various control cables required within the Power Plant or external to it for interfacing 11kV Switchgear or sensors or any other sub-systems including cable trenches, raceways, etc.
- All technical parameters including but limited to Net Efficiency, Net Output, Power Plant Availability, Construction of Power Plant Building including all facilities as well as all related sub-systems such as:
    - Plant Ventilation and air-conditioning in office and similar areas,
    - Electrification and lighting systems
    - c. Emergency Lighting System, etc.
    - d. Fire Protection System w.r.t NFPA Standards



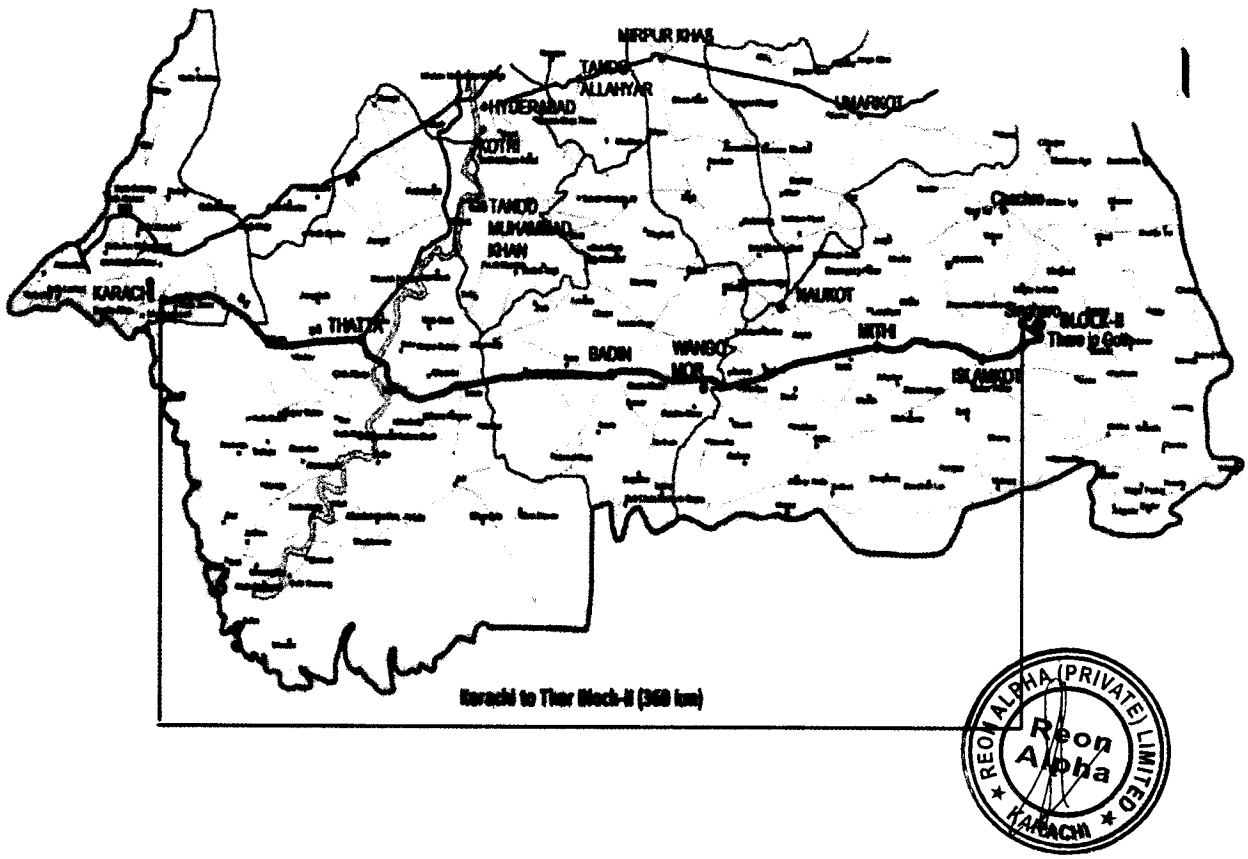
- Service transformer (11/0.415kV) for all power, lighting and other needs of the Power Plant, etc. including all LV switchgear and control gear, wiring, etc.
- All ancillary equipment such as cooling towers, related pumps, etc.
- The installed system shall meet applicable codes and standards. Safety signage and labelling should be mounted on the system as required
- All Solar Panels shall be made of Crystalline Silicon solar cells
- Contractor must install PV modules of highest efficiency in consideration with Solar map of Thar to utilize the day time effectively in all weather conditions.
- All the electrical installations and wiring for the PV system in accordance with codes and standards

Project Location

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot.

The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure 1.4-2 indicates both alternative routes.

ROUTE MAP : KARACHI TO THAR BLOCK-II



Operations and Maintenance Costs

The project also includes 24/7 O&M of the complete Power Plant including all its related systems and equipment. The O&M services shall be carried out for a period of 15 years (180 Months) and shall include but not be limited to the following items and their related costs, inclusive of all importation and local charges, duties, taxes, etc.

- Provision of all manpower as duly approved by the Company.
- Provision of all consumable material and parts.
- Provision of all routine and preventive maintenance parts. (Bidders are required to provide a priced list).
- Full costs relating to any repairs and replacements due to defects in the or break down of the equipment and systems strictly in accordance with OEMs requirements. The cost shall also include all dismantling, handling, shipment, etc.
- Provision of all lubricating oils, greases, coolants, rust inhibitors, and any other items as recommended by the original equipment manufacturers (OEMs).
- Provision of all emergency spare parts as per the recommendations of the OEMs or as directed by the Company. (Bidders are required to provide a priced list).
- Capital and Operational spares for 02 years to be kept in the inventory which will handed over to Company at the end of the Project.

It's specifically pointed out that the O&M shall also be inclusive of following as incurred throughout the O&M contract period

- Vehicles and their drivers for travel within and outside the Project site, including purchase, insurance, taxes, etc. relating to vehicles, their O&M and safety.
- All return travel costs of Bidder's personnel coming from abroad.
- Medical expenses, insurance, etc. as required on Bidder's personnel.
- Regular monitoring of requirements of all necessary items for O&M and arrangements for their timely availability at site.
- Reporting to company on all aspects of Power Plant operation and performance.

Feasibility & Financing:

The Project will cost approximately **PKR Four Hundred and Thirty One Million, Five Hundred and Ten Thousand**

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Total Major Components Cost	**280,884,031**
Total Local Supply and Service Cost	**121,895,590**
Total Reon Service Charges	**13,646,666**
O&M Equipment	**15,083,880**
Total - PKR	**431,510,167**

Whilst the sponsors (DLL) has one of the strongest balance sheet from any corporate in Pakistan and can finance the project on 100% equity it is expected to be funded from a combination of Equity and Debt as the group as adequate banks lines.

This group has running finance facilities obtained from the financial institutions of Rs 1,150,000 (2015: Rs. 650,000) under a mark-up arrangement. The facilities are subject to markup ranging from 3 months KIBOR + 0.90% to 1% which is determined at the start of each quarter and is payable on quarterly basis in arrears. The running finance under mark-up arrangement is secured by way of deposit of title deeds of land and pledge over Company's investment in related parties.

(Reported in Last Annual Accounts of 2016)

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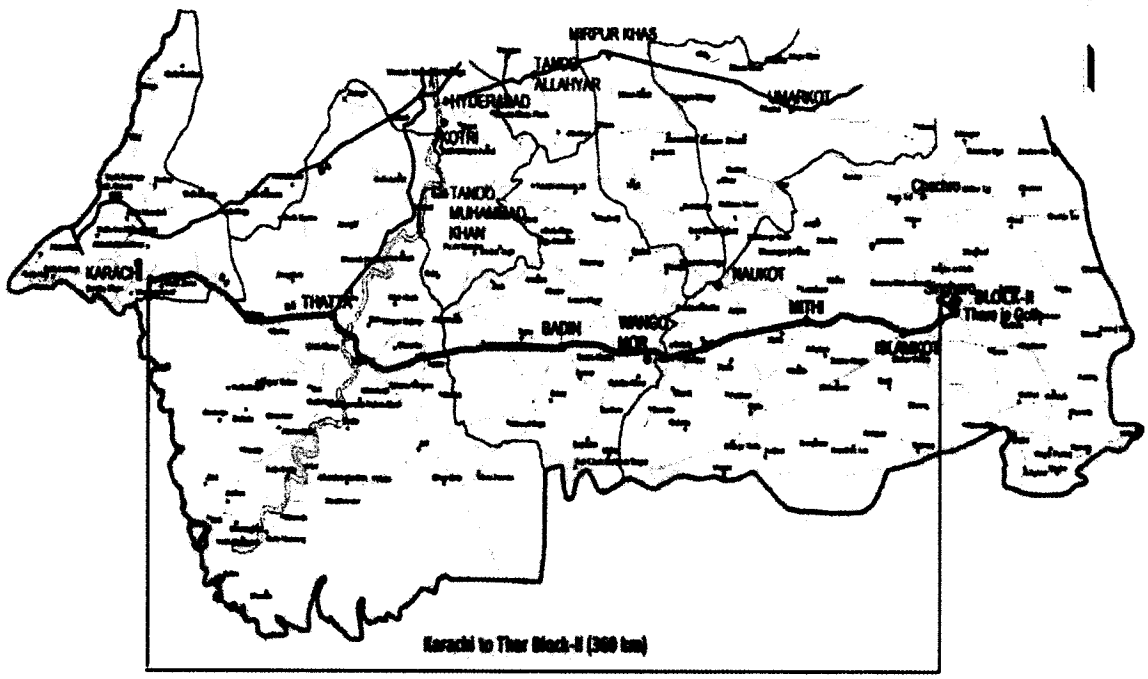
Site Overview:

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot.

The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure indicates both alternative routes.

ROUTE MAP : KARACHI TO THAR BLOCK-II



It is subtropical desert climate in Thar Coalfield, dry, little rain, monsoon ravaging and hot in summer and autumn.

Average monthly temperature for every year in Thar desert:

The lowest is 15°C （January 1984）; the highest is 34.7°C （May 1994）.

Average monthly temperature for 30 years:

the lowest is 16.4°C（Jan), the highest is 33.8°C （Jun)

The annually average temperature is 25.6-27.3°C, while the extreme high temperature can reach 51°C.

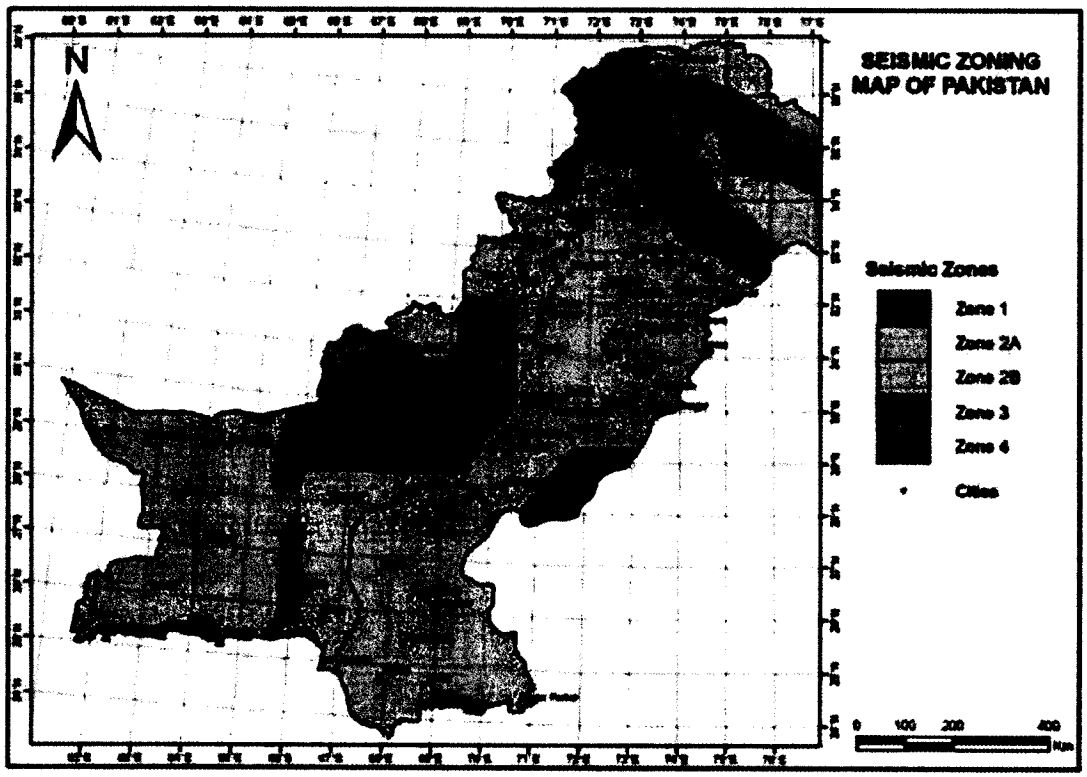
Thar area is in a semiarid subtropical zone with low Monsoon rainfall. Generally, most of the rainfall comes in July and August; November, December and January have the lowest monthly rainfall, with mostly 0 mm. The highest measured monthly rainfall is 278.1mm (September 2011). Average monthly rainfall of 37 years varies from 0.60mm (December) to 98.37mm

(August). Total minimum annual rainfall is 4.6mm （2002） and maximum is 1361.3mm （2011), with an average of 288.71mm.

As the area is semiarid, the humidity is low. The humidity is lower in winter while higher in summer, due to the summer rains. The average monthly humidity varies from 13% （Mar 1973） to 78% （Aug 1994）. Average annual humidity is 28.4% （1974）- 42.1% （1999）. 30 years average monthly humidity is 25% （Apr）- 40% （Aug).

The wind speed in Thar Desert area is higher in summer while lower in winter. This is due to the summer Monsoon. Lowest monthly wind speed is 0.6 knot (Dec 2004), and the highest is 21.1 knot （May 2006）. From April to September, wind speed is at around 6.45-10.48 knots. In May, Jun and July the wind speed reaches its highest velocity with more than 10 knots. During the rest of the year, the wind speed is low at about 2.45-4.83 knot.

The peak acceleration for earthquake in the block II is 0.2g, belonging to Magnitude VIII seismic fortification. Please refer Figure, Seismic Intensity Distribution of Pakistan, for more about the seismic intensity in the mining area.



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Environmental Benefits:

This system will help substitute the main generation source i.e. Diesel, hence curtailing the emissions. Annual CO_2 emission reduction is 5,123 metric tonnes per year. This is equivalent to the CO_2 sequestration done by planting 256,150 trees per year.

A life cycle assesment of the CO2 produced by solar PV is 40g per kWh as opposed to 700g CO_2 per kWh for diesel fuel.

Reference: Life cycle greenhouse gas emission of energy sources

https://en.wikipedia.org/wiki/Life-cycle_greenhouse-gas_emissions_of_energy_sources

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Socio Economic Benefits:

Renewable energy technologies have experienced rapid deployment over the past few years, mainly driven by the ambition to improve energy security, enhance energy access and mitigate climate change. Many countries are now exploring ways to stimulate social and economic growth through the development of the renewable energy sector. Investment in renewable energy can generate new sources of growth, increase income, improve trade balances, contribute to industrial development and create jobs.

Upon commissioning of a solar project, the economic benefit of the solar plant starts with the savings on foreign exchange for import of fossil fuel. Other benefits include the utilization and employment of local manpower.

This project will ensure that local manpower of Thar would be utilized for semi-skilled and non-skilled applications, even the training of this manpower would be ensured.

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Conceptual Design:

Generation Voltage:

Solar Power plant will be generating AC power at Low voltage levels of 400V 4W+PE system. Low voltage level will then step up through power transformers to the existing Diesel Genset Voltage levels i.e. 11KV to be synced with Electrical Network.

Power Factor & Frequency

SECMC 5MW solar power plant is using solar grid connected string Inverters of 60KW each to covert DC power of solar panels to Alternating Power. Grid connected inverters have the functionality to adapt the power factor of existing diesel genset grid. The range of Power Factor can be set from 0 – 1 leading /lagging, making it suitable for absorbing or delivering reactive power. the nominal power factor for Inverters is 0.995. Nominal Frequency of generation is 50Hz.

Automatic Generation Control & Ramp Rate:

The Automatic Sustainable Controller (DEIF ASC-4) is a controller designed to serve as a link between sustainable power plant (Solar) and genset plants, combining them so they work as one common hybrid system. The concept of the ASC-4 is to maximize sustainable power penetration, depending on the total load demand to the hybrid without compromising constraints such as minimum genset load demand.
The ASC-4 Solar is the variant designed for PV control, and it enables integration of PV power and genset power. The PV plant is handled as a base loading power- and reactive power provider, not as a voltage- and frequency provider. Therefore, the ASC-4 only operates the PV in case either utility or a genset constitutes a grid to which the PV can dispatch power.

Ramp rate of inverters is the function of MPPT algorithm. Normally solar power is set to ramp up or ramp down the generation within the period of 5-10 seconds from 0 – 100 percent. Ramp rate can be adjusted according to the behavior of gensets over loading and unloading due to Solar power variations.

Metering and Protection:

The distance between solar field and point of common coupling (POCC) has been calculated as 2 kilometers approximately. The metering of solar units will be performed at the main 11KV load bus bar. It is designed that all auxiliary loads will be connected before the point of connection to get the true reading for energy being evacuated into the diesel gensets' grid for mine loads.

Sensitivity Class for meter is 0.5s with bidirectional 4 quadrant calculations algorithm. Features including, total import and export units can be extracted over the period, TOD calculations, MDI, active and reactive power calculations, Et al.

5 MWp Solar power plant will be terminated on a single RMU unit having following protections for the line and load side;

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- Over and Under voltage protections
- Short Circuit protections
- Earth Fault detection
- Over current protection
- Emergency system shutdown protection.

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Technical Summary:

- Polycrystalline 325W Solar Modules with efficiency 16.75% are used in the design
- 50 KW grid connected solar inverters, 400V three phase, 98.3% have been considered
- Step up Transformers 0.4 / 11KV ONAN are used
- Medium Voltage Switchgears 11KV / 630A
- System will be connected to 11KV Bus Bar of Diesel Generators
- DC/AC Ratio of 1.23 for Inverters has been considered
- Maximum AC output of the system is assumed to be 4050 KW
- Output of the system is based on instantaneous Irradiation values of Solar Energy
- 18 Acres of land area required for the installation of solar plant

Bill of Materials:

S. No.	Components	Qty (No.)
1	Polycrystalline Solar Modules 325W	15390
2	Grid Connected Solar Inverters 50KW 3 Phase	81
3	0.4 / 11KV Step up Transformers	5
4	Medium Voltage Switchgears	5
5	Diesel Gensets and Solar Energy Control System	1

Energy Generation:

S. No.	Efficiency Parameters	
1	Performance Ratio of the System	80.8%
2	Capacity Utilization Factor	17.9%
3	Energy Generation Units	7.85 Million KWh

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ANNEXURE - 16

SCHEDULE – III

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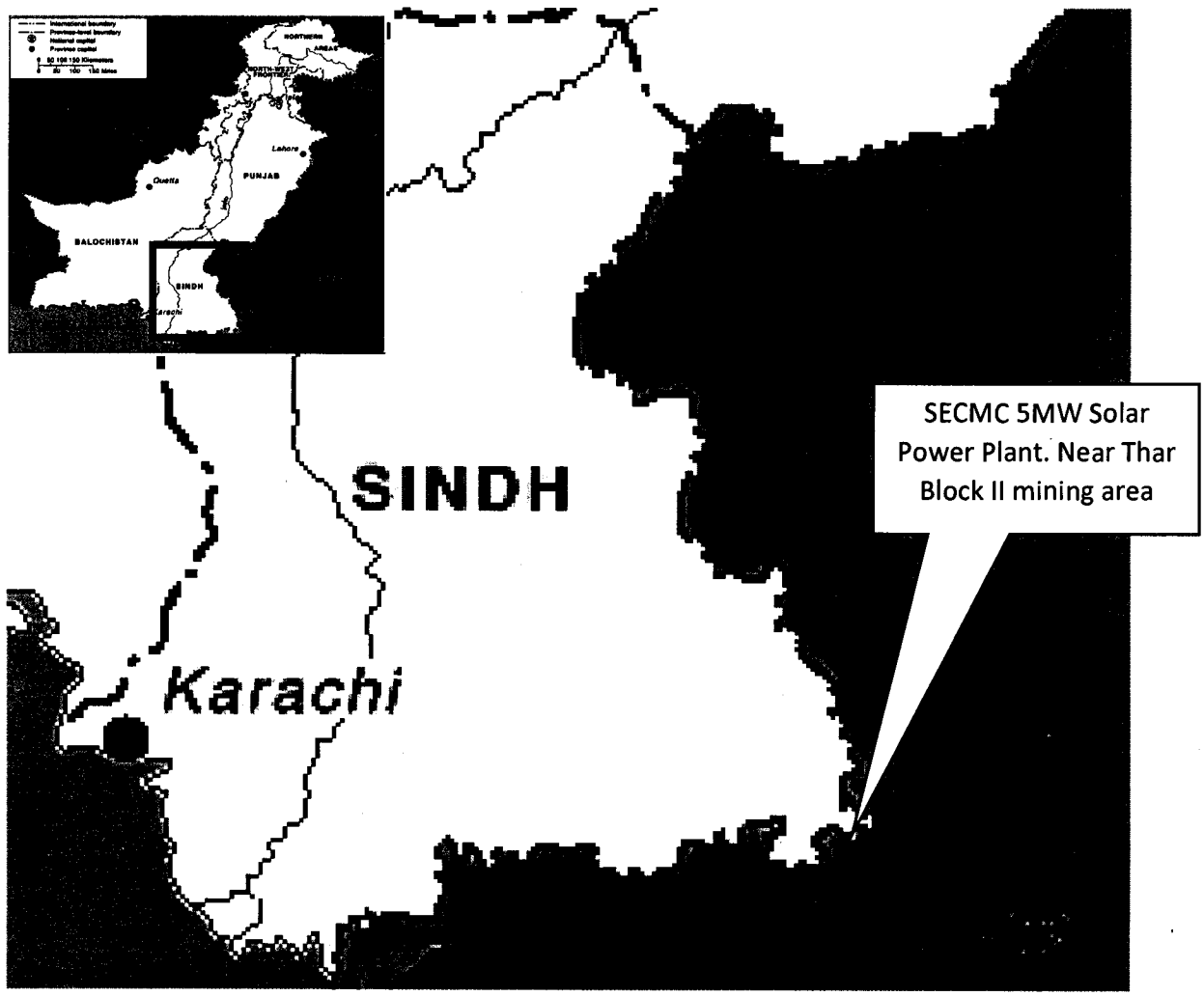
LOCATION MAPS, SITE MAPS, LAND

Location Map:



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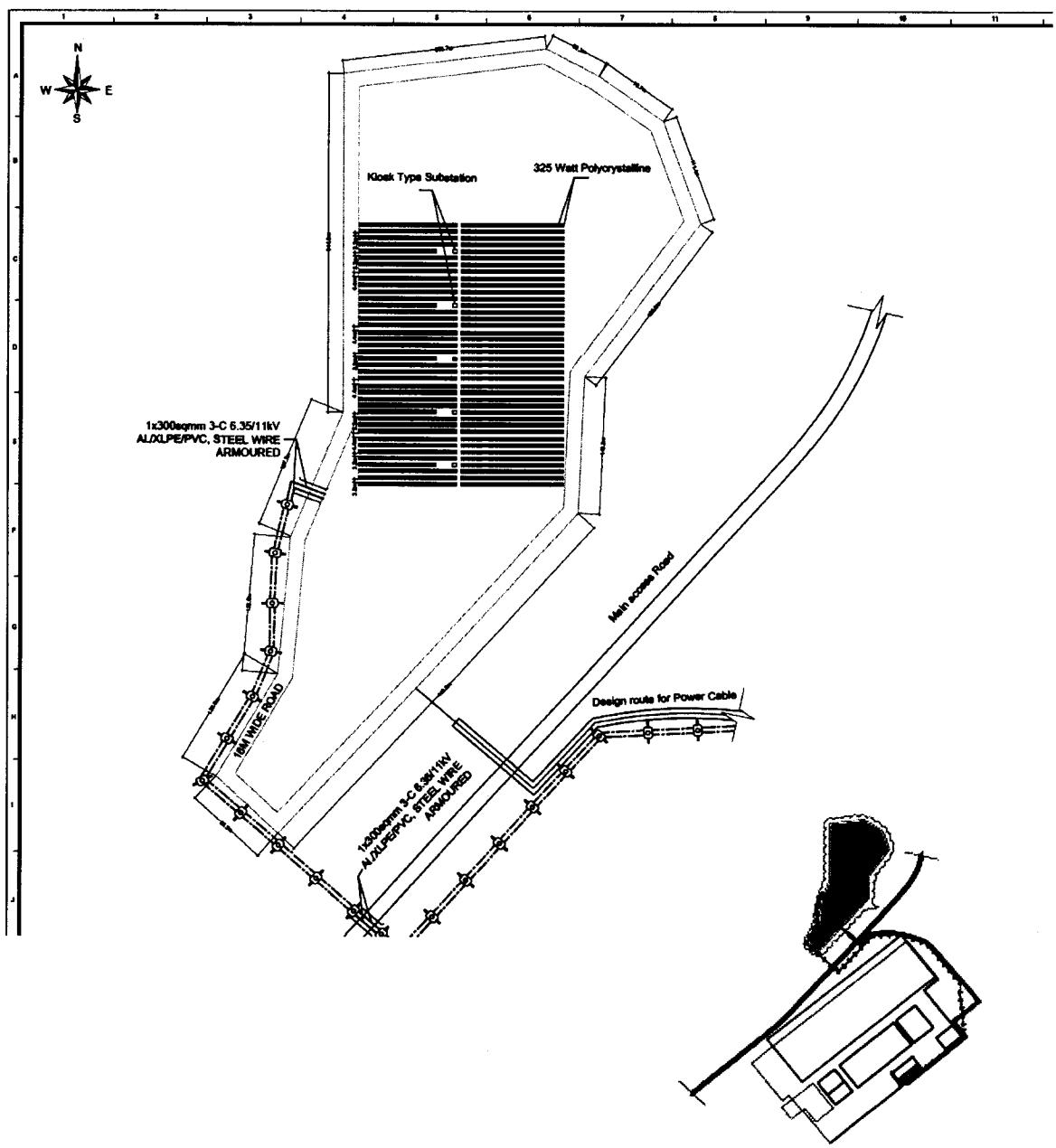
Site Location and Layout:

Solar Site covers an area of 18 Acres / 72843 sq. meters and is in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot.

The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot.



Key Plan

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TECHNOLOGY, SIZE OF PLANT, NUMBER OF UNITS

System Components

S. No.	Components	Qty (No.)
1	Polycrystalline Solar Modules 325W	15390
2	Grid Connected Solar Inverters 50KW 3 Phase	81
3	0.4 / 11KV Step up Transformers	5
4	Medium Voltage Switchgears	5
5	Diesel Gensets and Solar Energy Control System	1

System Design Assumptions

- Polycrystalline 325W Solar Modules with efficiency 16.75% are used in the design
- 50 KW grid connected solar inverters, 400V three phase, 98.3% have been considered
- Step up Transformers 0.4 / 11KV ONAN are used
- Medium Voltage Switchgears 11KV / 630A
- System will be connected to 11KV Bus Bar of Diesel Generators
- DC/AC Ratio of 1.23 for Inverters has been considered
- Maximum AC output of the system is assumed to be 4050 KW
- Output of the system is based on instantaneous Irradiation values of Solar Energy
- 18 Acres of land area required for the installation of solar plant

Energy Generation Number:

The solar plant is designed to produce 7850,000 KWh for the first year from the date of COD.

Technology & Number of Units:

S.No.	Parameters		Qty
1	Technology	Solar Photovoltaic (SPV)	
2	Size of Plant	5MW	
3	Solar Modules	Polycrystalline Solar Modules 325W Jinko or Tier 1 Equivalent	15390
4	Inverter	ABB Trio 50KW Grid Connected Inverter	81
5	Transformers	1000KVA 0.4 /11KV ONAN Transformers Siemens or Equivalent	5
6	Medium Voltage Switchgears	11KV 630 Amps 25KA Siemens or Equivalent	5

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Fuel Type

Since, this is a Solar Energy based Plant, no fossil fuel will be used for the generation.

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Emission Values

There will be "NO" carbon emission by the generation of Solar Energy.

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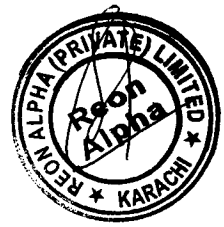
Cooling Water Source

Not Applicable in Solar Energy Plant.



Interconnection with National Grid

Not Applicable. Since, this plant is not connected to local grid rather will be connected to autonomous Diesel generators at Sindh Engro Coal Mining Company.

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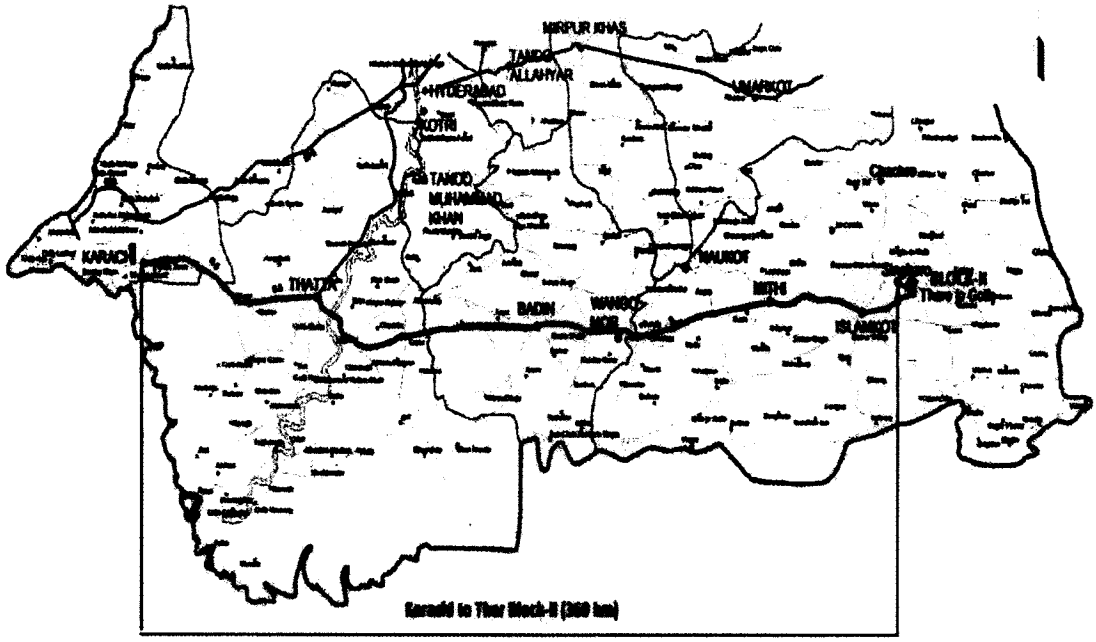
InfraStructure

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot. The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure 1.4-2 indicates both alternative routes.

ROUTE MAP : KARACHI TO THAR BLOCK-II



Project cost, information regarding sources and amounts of equity, debt.

Feasibility & Financing:

The Project will cost approximately **PKR Four Hundred and Thirty One Million, Five Hundred and Ten Thousand**

Total Major Components Cost	**280,884,031**
Total Local Supply and Service Cost	**121,895,590**
Total Reon Service Charges	**13,646,666**
O&M Equipment	**15,083,880**
Total - PKR	**431,510,167**

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Project Commencement & Completion

This project will be completed in a period of 6 months. Major activities of project involve, Detailed Engineering Design, procurement of Local and Imported Equipment, and Construction involving civil, electrical and mechanical works. Major Milestones are;

S. No.	Major Milestone	Timeline
1	Detailed Engineering Design	1 month
2	Procurement	1.5 months
3	Construction	2.5 months
4	Commissioning and Testing	1 month

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ESSA (Environmental and Social Soundness Assessment)

Executive Summary:

Reon Energy Limited intends to develop a 5 MW PV- Diesel Hybrid solar photovoltaic (PV) Captive power producer (CPP) plant ('the Project') in Thar Block II of Sindh province of Pakistan. This document presents the results of an initial environmental examination (IEE) analyzed for the construction and operation of the proposed Project.

The project will be developed as a hybrid solar plant, connected to the internal Diesel Genset's grid of 11KV at Sindh Engro Coal Mining Company. The project is based on clean renewable solar energy and is in the premises under Sindh Engro Coal Mining Company (SECMC). Project has assessed 18 Acres of land but the final footprint of the system will occupy an estimate of 15 Acres. A fixed tilt optimum angled solar system has been considered. Conversion of solar panel electrical output from direct current (DC) to alternating current (AC) will be achieved by means of string inverter stations called 'power blocks'. Power blocks collect low voltage DC power from the PV array and inverters and transform it into medium voltage AC (11KV). Several inverters may be used in parallel in a single power block, each of which will be connected to the substation.

Description of Environment:

Physical Environment

It is subtropical desert climate in Thar Coalfield, dry, little rain, monsoon ravaging and hot in summer and autumn.

Temperature:

Average monthly temperature for every year in Thar desert: The lowest is 15°C (January 1984) ; the highest is 34.7°C (May 1994) . Average monthly temperature for 30 years the lowest is 16.4°C (Jan) , the highest is 33.8°C (Jun) . The annually average temperature is 25.6-27.3°C, while the extreme high temperature can reach 51°C.

Rainfall:

Thar area is in a semiarid subtropical zone with low Monsoon rainfall. Generally, most of the rainfall comes in July and August; November, December and January have the lowest monthly rainfall, with mostly 0 mm. The highest measured monthly rainfall is 778.1mm (September 2011). Average monthly rainfall of 37 years varies from 0.60mm (December) to 98.37mm (August). Total minimum annual rainfall is 4.6mm (2002) and maximum is 1361.3mm (2011) with average of 288.71mm.

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Humidity:

As the area is semiarid, the humidity is low. The humidity is lower in winter while higher in summer, due to the summer rains. The average monthly humidity varies from 13%(Mar 1973 to 78% (Aug 1994) . Average annual humidity is 28.4% (1974) - 42.1% (1999) . 30 years average monthly humidity is 25% (Apr) - 40% (Aug).

Wind Direction:

From March to October the wind mainly blows from Southwest, while from November to January the wind direction is mainly to the South and Southwest. The wind speed in Thar Desert area is higher in summer while lower in winter. This is due to the summer Monsoon. Lowest monthly wind speed is 0.6 knot Dec 2004) , and the highest is 21.1 knot May 2006) . From April to September, wind speed is at around 6.45-10.48 knots. In May, Jun and July the wind speed reaches its highest velocity with more than 10 knots. During the rest of the year, the wind speed is low at about 2.45-4.83 knot.

Hydrology:

There is no surface water in Thar Desert in Pakistan. Rann of Kutch is about 35km south to Block II where groundwater is shallow and crops out at some places presenting plenty of saline water on the surface. There is a canal near Naukot coming from Chotiari Reservoir. It is about 100km away from the first mining area.

Seismic Intensity:

The peak acceleration for earthquake in the block II is 0.2g, belonging to Magnitude VIII seismic fortification. Please refer to Figure 1.1-5, Seismic Intensity Distribution of Pakistan, for more about the seismic intensity in the mining area.

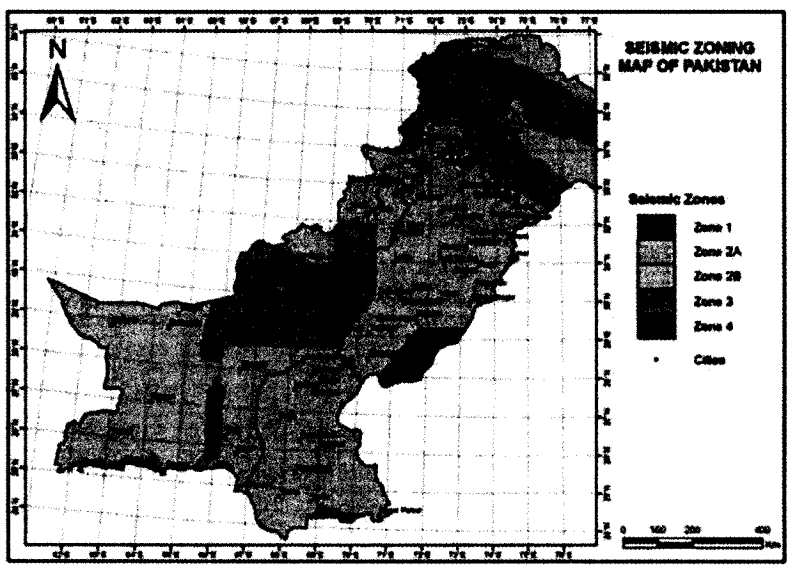

Figure 1.1-5 Seismic Intensity Distribution of Pakistan

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Project Environmental Impacts and Mitigation Measures:

This section discusses the potential environmental impacts, assesses the significance, recommends mitigation measures to minimize adverse impacts, and identifies the residual impacts associated with the proposed activities of the project during the construction and operation phase of the proposed project at the proposed site and of secondary actions like potable, raw water and wastewater lines.

Identification of Potential Impacts

In the first step, potential impacts of the project are identified, using professional judgment, published literature on environmental impact of similar projects, environmental guidelines and checklists, and field visits.

- Impact on Occupational health and safety/ Public Health (of contractors, workers and nearby community. It includes safety at work, Fire, explosives, diseases etc)
- Ground water or surface water
- Impact on energy
- Impact on natural resources
- Impact on aesthetics
- Impact on land use
- Impact on land form
- Impact on soils
- Impact on traffic and transportation
- Noise or vibration
- Air quality (ambient air quality and indoor air quality).
- Solid Waste Management (including domestic waste, construction waste)
- Impact on population
- Impact on utilities and infrastructure
- Socio-economic impact (people, their social, cultural values, and aspirations

Design Phase

Design phase is the phase that is meant for the preparations prior to the construction. During design phase, engineers (meant for construction) will come and visit the site. Necessary preparations will be started for construction. Gant chart will be prepared. Visits by the engineers and contractors to check the site and structure to be build but there will not be routine or regular visits to the site but once in a week and design phase will last only for a month or so.

Impacts Prediction

Impact on Air

During design phase, air emissions that exceed federal or provincial limits or standards will not be exceeded because during design phase, there would be lesser visits to the site, so

lesser would be the atmospheric emissions. And the source of these emissions would be the motor vehicles only (for personal use). There would be no hazardous emissions (e.g. high amount of NOx, SOx and COx) and no objectionable odours as well as alternation of air temperature.

Impact on Ground water/ surface water

There would be no utilization or alteration to the course or flow of water during design phase so there would be no impact on this component of environment.

Impact on Solid Waste

It may create only litter and trash waste (recyclables).

Noise Impact

It will not increase significant amount of noise during design phase of the proposed project and will be within acceptable limits or NEQs.

Impact on Soils

There would be no change in soils and land forms i.e. the construction activity is not going to occur on ground.

Impact on Land forms

Land forms will not change and this component is also having no impacts as there would be no change in ground contours. There are no unique physical features at the site so land forms will not be changed.

Impact on Land use

The project will have a positive impact on land use but during design phase the land use is not going to be altered, so this impact would be neglected in this phase.

Impact on energy

Design phase is not going to alter or use the energy like electricity, gas, petrol etc. in excessive amount as there will not be routine or regular visits to the site but once or twice in a week and design phase will last only for a month or so.

Impact on transportation and traffic circulation

There will be few additions to the movement of additional vehicles but these will also for once or twice in a week during design phase. In this phase, there is no need for the additional parking facility. This would in turn lead to no traffic hazards.

Impact on natural resources

There won't be any increase in the rate of usage of any natural resource like any minerals, additional fuel for vehicles, oil, construction materials, and natural food products. But there would be increase in the amount of usage of paper for map-making, enlisting items (e.g. types of construction materials to be used), letter writing and receipts (e.g. of billing & quotations), etc.

Impact mitigation

- Try to recycle the paper and prevent throwing it in the ordinary bin.
- Use of computer technology i.e. E-mails instead of focusing on paper

- Lessen the paper use and conserve the natural resources.

Impact on population

This project is not going to disturb or relocate the existing community, so there would be no change in population.

Impact on utilities and infrastructures

There would be no alteration in the existing utilities like communication system, water courses, power transmission lines, electrical wirings, etc due to the project's design phase. There would be no impact on nearby infrastructure e.g. nearby shops/molls, residences, institutes, mosques, communication offices, banks etc. during design phase.

Impact on economy

The economy is having no adverse effects on local or regional income levels, land values, or employment etc. but there will be regional beneficiary impacts on income during design phase of the project in such a way that there will be hiring of consultants, engineers, contractors and labors etc that will increase their income.

Impact on Public health

The design phase will impart no adverse potential health effects to the people. **Accidental Risk**

Impact on Flora/ Fauna

There will be no disturbance to the existing flora and fauna of the proposed design phase of the project.

Impact on Aesthetics

No change would result in any scenic vista or aesthetics of the vicinity. No visual or temporary scenic blight during design phase.

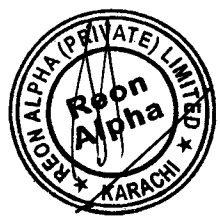
Construction Phase

Construction phase is the phase that is meant for the construction by the hired contractor. Contractor responsibility is to bring labors, materials and equipment from suppliers. Then in the next step there will be commencement of the construction, construction vehicles & machines (concrete mixer machine and trolleys) and materials (course aggregate and fine aggregate, cement, bricks) and other equipment and tools (trolleys, cutters, hammers, saws, ladders, screwdrivers, wrenches, steel reinforcement, scaffolding etc.) will be assembled.

This section is also focusing the potential impacts (both positive and negative) related to the construction phase along with the mitigation measures stepwise because it is likely that the new construction activities will surely affect the surrounding areas.

Impact on Air

The impact on air of this construction activity will be for short-term i.e. for construction phase only. Therefore, no high violation will be resulted.



Impact on Ground water/ surface water

There would be drilling and boring holes in the groundwater for the construction activities. There would be little alteration to the course or flow of water during this phase so there would be less impact on this component of environment.

Noise Impact

Noise pollution will be caused by heavy vehicles movement. The project site is located away from residential area. So, noise will not create any harmful impact.

Impact on Soils and landform

There will be change in soil condition. Soil erosion will decrease and it will positively impact by reducing carbon footprints.

Impact on Flora and Fauna

There will be no impact on fauna but little number of bushes will be cut during structure installations.

Impact on Land use

The project will have a positive impact on land use as this land will be used for emission free power generation.

Impact on energy

Construction phase is going to use the energy like electricity, petrol or diesel in excessive amount as there will be routine or regular visits to the site (i.e. energy will be used for transport in the form of petrol or diesel) and for moving machinery.

Impact Mitigation

There will be a minimal impact on the use of energy as this phase is for short term period say e.g. 5-6 months and the only solution is to use these energy resources in conservation mode (i.e. minimize the use but do not misuse like for example, keep turning on the machine even when it is not required.

Impact on transportation and traffic circulation

There will be additions to the movement of additional vehicles during construction phase but there are already existing alternating routes for traffic (street traffic) so no need to define alternating routes and parking facilities.

Impact mitigation

For transportation of the construction equipment, routes and duration must be defined.

Impact on population

This project is not going to disturb or relocate the existing community, so there would be no change in population during this phase as well.

Impact on utilities and infrastructures

There might be little disturbances to the existing utilities like communication system, water courses, power transmission lines, electrical wirings and nearby infrastructure e.g. nearby residences, mosques, communication offices, etc. during construction phase. But that impact is usually in terms of noise only and easily neglected.

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Impact on economy

The economy is having positive impacts on local and regional income levels, land values, & employment in such a way that there will be hiring of consultants, engineers, contractors and labors etc that will increase their income. Therefore, this project will surely enhance socio-economic welfare e.g. health and employment (of labors, contractors, environmentalists, equipment/ materials suppliers, nearby hotels).

Accidental Risk

There may be accidental risks like falls or slips; cuts or injuries during hammering, sawing and drilling; and electric failure or sudden short circuit during electrocution works. There will be no handling of such chemical, drugs, radiations or explosives during construction phase that leads to catastrophic events or accidents.

Impact mitigation

Trained workers must be hired for construction by the contractors.

First aid team must be assigned by the hospital management to provide aid to the workers during time of emergency.

Impact on Aesthetics

There will be visual, temporary scenic blight during construction phase due to the construction activity but as this will be temporary and only if there is no containment of the construction materials dumping and usage, so it is neglected and predicted that the current project will impart no negative impact on the aesthetics of the area.

Impact mitigation

Containment or enclosure must be provided around the storage of construction materials.

Impact of Solid Waste

Solid wastes generated from construction include abandoned construction materials. These solid wastes are usually harmless but will affect environmental sanitation of the construction site and cause environmental damage if improperly dumped offsite.

Impact Mitigation

- Implement Solid Waste Management procedure of Reon energy Limited.
- Construction waste must be collected separately with segregation and routinely.
- Multi-compartment collection bins should be installed to facilitate reuse, recycle of this kind of waste i.e. if the construction material is in such form that can be reused or recycled so put separate bins for that and they can either be reused or recycled at the current project or if it is not needed then sell and transport it to the local market in sealed containment.
- The solid wastes must be collected regularly by the solid waste management authority and cleaned up by the contractors in a timely manner.
- The construction activity should be taken place in containment, boundary and limits so that it does not create harm to any person, place or property.

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Safety and Emergency Plan

EMERGENCY RESPONSE PLAN (ERP)

Purpose

To describe responsibilities in preparation for, response to and recovery from any reasonably foreseeable incident.

Priorities

Secure the Health and Safety of all personnel involved Minimize any impact on the environment Minimize any impact on property and assets.

Roles and Responsibilities

(For events deemed to be major, CUSTOMER may be obliged, by its responsibilities under its agreements with the Government, to assume control of emergency response activities. In these circumstances the CUSTOMER Representative shall clearly advise REON that CUSTOMER is assuming control and the REON Project Manager will work under CUSTOMER instruction).

For emergency response activities managed by REON, key roles and responsibilities are detailed below.

Emergency Response Team Leader (Project Manager)

The ERT Leader shall carry overall responsibility for REON emergency response execution. Key responsibilities shall include:

- Providing leadership and direction in the event of an emergency.
- Ensuring that emergency response planning, preparedness and execution is consistent with the requirements of CUSTOMER.
- Ensuring that appropriate emergency response teams are defined and prepared for the various emergency response scenarios identified in this plan.
- Notification to CUSTOMER Project Manager of any emergency incident. This is a mandatory requirement for all emergencies. Notification of an emergency incident should be made via radio, telephone or messenger to CUSTOMER Operations CCR as soon as practicable upon receiving advice of same.
- Following initial notification, liaison with CUSTOMER Project Manager during the execution of any emergency response.

Mobilization of additional resources, third party assistance etc. Liaison with manage

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Site Engineer HSE

Reporting to the ERT Leader, the Site Engineer HSE and/or his substitute is responsible for ensuring at site that provisions are in place for emergency response, including:

- Muster points.
- Arrangements for conducting head counts.
- Identification and Mobilization of the Fire Team.
- Setting up drills and exercises.
- Procurement of firefighting equipment.

In the event of any emergency the Site Engineer HSE or a member of the HSE team shall take the following actions:

- Shall attend the site of the incident, assess the situation and issue direction to the concerned parties and to the Fire Team.
- Ensure that messages have been communicated to The Emergency Response Team Leader.
- Evaluate the scale of the incident and decide whether additional resources are required to adequately deal with it.
- Liaise with site supervision for withdrawing any permits.
- Liaise with site supervision for the mobilisation of any plant and equipment necessary for dealing with the emergency.
- Limit access to the area with barriers or other means to prevent unauthorised access.
- Co-ordinate the reinstatement measures following stabilisation of incident.
- Prepare a full report.

Fire Team

- The fire team will be selected and trained appropriately.
- The Site Engineer HSE shall appoint a Fire Team Leader (and his substitute) who will direct personnel under his control.
- The fire team leader will have had training and preferably previous experience in emergency response actions.
- All the members of the fire team shall report to the Fire Team Leader.
- Appropriate training shall be provided to members of the fire team.
- An electrician or instrument specialist will be included in the fire team. His responsibility the electrical isolation of areas as necessary.

Firefighting appliances shall be maintained in accordance with their specifications. Sufficient redundancy shall be incorporated into the facilities to allow for periodic unavailability during maintenance. A designated member of the HSE Team shall regularly confirm that fire extinguisher and other appliances are recharged and maintained as appropriate.

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General Considerations

Emergency response drills shall be conducted at least quarterly for each principal area i.e. camp and the work site, the observations and debrief notes shall be recorded. The Site Engineer HSE shall analyse the findings and identify any remedial actions required.

The emergency procedure shall be updated from time to time to reflect observations made.

- Training shall be conducted on regular basis for emergency response teams.
- The location of emergency facilities e.g. firefighting appliances shall be clearly identified on plans displayed at conspicuous locations.

Raising the alarm and plan activation

Activate the alarm and notify the ERT Leader.

Provide the following details:

- Location of the Incident.
- Natures of incident e.g. fire, number of injuries, etc.
- If it is a fire, state type - oil, gas, electric or other and state wind direction and strength.
- Identify yourself giving your name and telephone number or radio channel.

Alarm and Communication

Communication is a critical factor in handling an emergency. To control the situation by the earliest possible action, any employee must be able to act and raise an emergency alarm.

The assembly points shall be clearly indicated.

- On hearing an alarm all personnel shall vacate the work place. Before leaving, each person shall ensure that the area is as safe as possible by switching off all power tools, running machines etc.
- All personnel shall muster at the assembly point as per the plan. The designated members of the HSE team shall provide guidance and assistance for mustering at the correct assembly point.
- The subcontractor's HSE team members shall take directions from the Site HSE co-ordinator.

Emergency Contacts List

List of all emergency services contacts will be displayed at site, including contact numbers of ERT and key persons (Project Manager REON, subcontractor Manager, Site HSE Engineer)

Incident response

Emergency situations occurring at the work site have the potential to cause serious injuries, loss of life and property damage.

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The following is a list of incidents that may be classed as emergencies for the purpose of this procedure:

- Scaffold collapse
- Fire involving fuels, gases and other materials
- Medical emergency / Serious Injury
- Failure of lifting equipment
- Pressure test failure
- Collapse of an excavation involving personnel
- Vehicle accidents
- Collapse of structures/steelwork
- Snake Bite

In an emergency, or on hearing the "Stop Work Alarm", every supervisor shall ensure the following:

- All work is stopped at once.
- All equipment is shut down and put in a safe place.
- All men are evacuated to a pre-determined assembly point in an orderly manner.
- Arrange best possible interim medical arrangements for patient or injured person during transfer to hospital or while attendance by doctor is being arranged.
- Ensure the presence of ambulance 24 hours with driver.
- Anti-Snake Venom must be present at site.
- A roll call is taken and every man is accounted for, awaiting further instructions
- Keep the zone affected by the emergency clear and remove any vehicles that could cause a restriction to the emergency team

Evacuation

Activate the emergency alarm to evacuate the area safely and ensure that unnecessary personnel leave the site by a safe route. Assign someone to advise security to open the Facility main gate for emergency vehicles.

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System Studies

Depending on the size of the PV Plant, distribution is carried out via different busbars. These multiple configurations usually depend upon:

- Current carrying capacity in Normal and Fault conditions
- No of outputs
- Fault Isolation
- Connection method used

The SECMC project of 5MWp has 5 Transformers of 1000 KVA which are terminated on a PV Bus through individual separate MV panels. The load is to be operated along with 9 generators which are directly terminated of Genset Bus which is separated through a bus coupler. The buses are incorporated for flexible flow of power and protection.

It is proposed that PV Bus and Genset Bus will be interfaced dual Single Section Bus system. During the normal routine, the Power Flow will be directed towards separate Genset buses through MV panel 01 & 02. These panel consist of 12KV 630A 3-Pole VCB which is enough to support 6MW of power. However, in case there is prolonged fault due to which any of the MV panel needs maintenance and servicing so now, through bus coupler the complete 5MW solar power will be routed via second VCB available. Additionally, it is crucial to consider the flow of high currents in busbars. This leads to the induction of magnetic fields in the surrounding exposed metal conductive parts (enclosure panels, frames etc.). The temperature rise in these exposed conductive parts should be avoided. Electrodynamic forces that are exerted surrounding busbar connection should also be considered. Hence sufficient clamping force should be applied ensure good lasting contact.

SINDH ENGRO COAL MINING COMPANY
(S E C MC)

Short Circuit

Study

For

5 MWp Solar PV Power Project

At

Open Pit Lignite Mine in Thar Block-II

Sindh, Pakistan

November, 2017

REON /TSEC DOC NO. SPPTHR01, Rev.0

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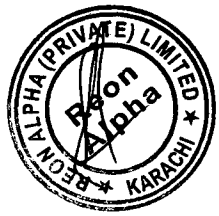


1.0 INTRODUCTION

In Thar Block-II, Sindh, Open Pit mining is underway for which Sindh Engro Coal Mining Company has arranged local diesel generator based electricity and in the first stage four (4) Nos. 1600 kW Container Type Diesel Generating Sets are installed generating power at 11 kV, 50 Hz as presently in the vicinity of the project there is no availability of National Electricity Grid.

The existing generating system is presently being augmented with an additional similar five (5) Nos. 1600 kW diesel generating sets thus bringing the generation capacity upto 14,400 kW with a total of 9 diesel generators.

In order to utilize renewable energy source, i.e. Solar Energy which is available in abundance at the mining facility in Thar, a 5 MWp Solar PV Power Project is planned to be implemented in the first stage to be integrated with the existing diesel power generation.

2.0 ELECTRICAL SYSTEM

The existing power supply and distribution system at coal mine facility comprises the main power generation area near which is the electrical substation which houses the 11 kV Main Power Generation Switchboard equipped to handle 9 generators.

The Switchboard is rated 11 kV, 3W, 50 Hz, 1250 A with the bus rated for 31.5 kA/4s. The Switchboard has 630 A draw out type VCBs as generator breakers and a 1250 A VCB Tie breaker. Power from this switchboard is sent to another Switchboard, the 11 kV Main Power Distribution Switchboard through two 1250 A VCBs.

The 11 kV Main Power Switchboard has the same bus rating as the Main Power Generation Switchboard and has 16 Nos. 630A outgoing draw out type VCBs which include two spares. The Switchboard has a 1250 A VCB Tie breaker.

The power from the 11 kV Solar Power Switchboard will be supplied to the 11 kV Main Power Distribution Switchboard through two 630 A VCBs which are presently available as Spare.

The power to the mining and housing facilities is routed from the above Distribution Switchboard by cable and overhead lines.

Under the 5 MWp Solar PV Power expansion work, low voltage power at 400 V will be provided by the inverters to the 400V Solar LV Panels which will supply power by cable to Step-up transformers rated 1000 kVA, 0.4/11 kV. The stepped up power at 11 kV will be controlled with 11 kV draw out type 630A VCBs. The power at 11 kV will then be routed to the 11 kV Solar Power Switchboard located about 2 KM away using overhead line conductors.

3.0 CALCULATIONS

In the absence of a Electrical Power Grid in the area, the Open Pit Lignite Mine in Thar Block-II, SECMC has established a local power generation facility for providing power to mining and housing facilities.

Presently power is generated using four (4) 1600 kW Prime power rated diesel generators producing power at 11 kV. The power from 11 kV Main Power Generation Switchboard is fed to a 11 kV Main Power Distribution Switchboard which distributes power to mining and housing facilities.

The power generation is being augmented with additional five (5) diesel generators of similar type and size with a total capacity of 9 X 1600 kW = 14.4 MW.

3.1 ASSUMPTIONS

a) For the purpose of carrying out Short Circuit Calculations, information on the existing electrical system is needed since the Solar PV Power has to be integrated with the power that is generated by the diesel Generating System.

SECMC has provided the following information:

Position of short-circuit	Per unit reactance	Steady short-circuit current	Surge short-circuit current	Effective value for full short-circuit current impulse	Short-circuit power
		Id(kA)	ich(kA)	Ich(kA)	S(MVA)
11kV Busbar of distribution room of generator set & 11kV Busbar of the main distribution room	1.88	2.67	6.99	4.16	53.3

Table 1.0 Information from SECMC with four (4) 1600 kW (2000 kVA) each Generators

b) For the four (4) Generator System, the Per Unit Reactance is 1.88 (pu) which is used.

c) As the System is presently being upgraded, the Study is based on using 9 X 1600 kW generators.

d) Determination of Base Values has been carried out and is noted below:

#	Symbol	Base Value	Value	Unit
1	S_b	Apparent Power	2	MVA
2	$kVA_{b\,HV}$	Voltage HV	11	kV
3	$kVA_{b\,LV}$	Voltage LV	0.4	kV
4	$Z_{b\,HV}$	Impedance HV	60.5	Ω
5	$Z_{b\,LV}$	Impedance LV	0.080000	Ω

Table 2.0 Determination of Base Values

e) Determination of Per Unit Values:

#	*Equipment*		*Rating*		*Impedance*			*Remarks*
		Tag	*Given*	*Unit*	*Given*	*Unit*	*in Base*	
1	Step-up trafos	Trafo 01-05	1	MVA	0.05	pu	0.1	Change of base MVA
2	Cables	From LV Panels 01-05	3x25	mm^2	0.03	Ω	0.3750	Ref Cable Table (4D2B): z = 1.5Ω/km Length 20m
~~3~~	Overhead line	From kiosk to substation	DOG		0.8776	Ω	0.0145	R=0.25Ω/km, X=0.3606Ω/km →Z=0.4388Ω/km. Length=2km
4	Inverter	Thevenin equivalent			5.2174	Ω	48.7503	92A @ 480V. Change of base voltage (400V to 480V)
5	Generator	5 in future parallel with existing 4	0.15	pu			0.03	Equivalent X_d" in parallel operation. Assume each generator X_d" is 0.15 pu

Table 3.0 Determination of Per Unit Values

3.2 CALCULATION

For Short Circuit Calculations at 400V Solar Power LV Panel, please see Reactance Diagrams, Sketches SK-01 to SK-04 (Appendix A).

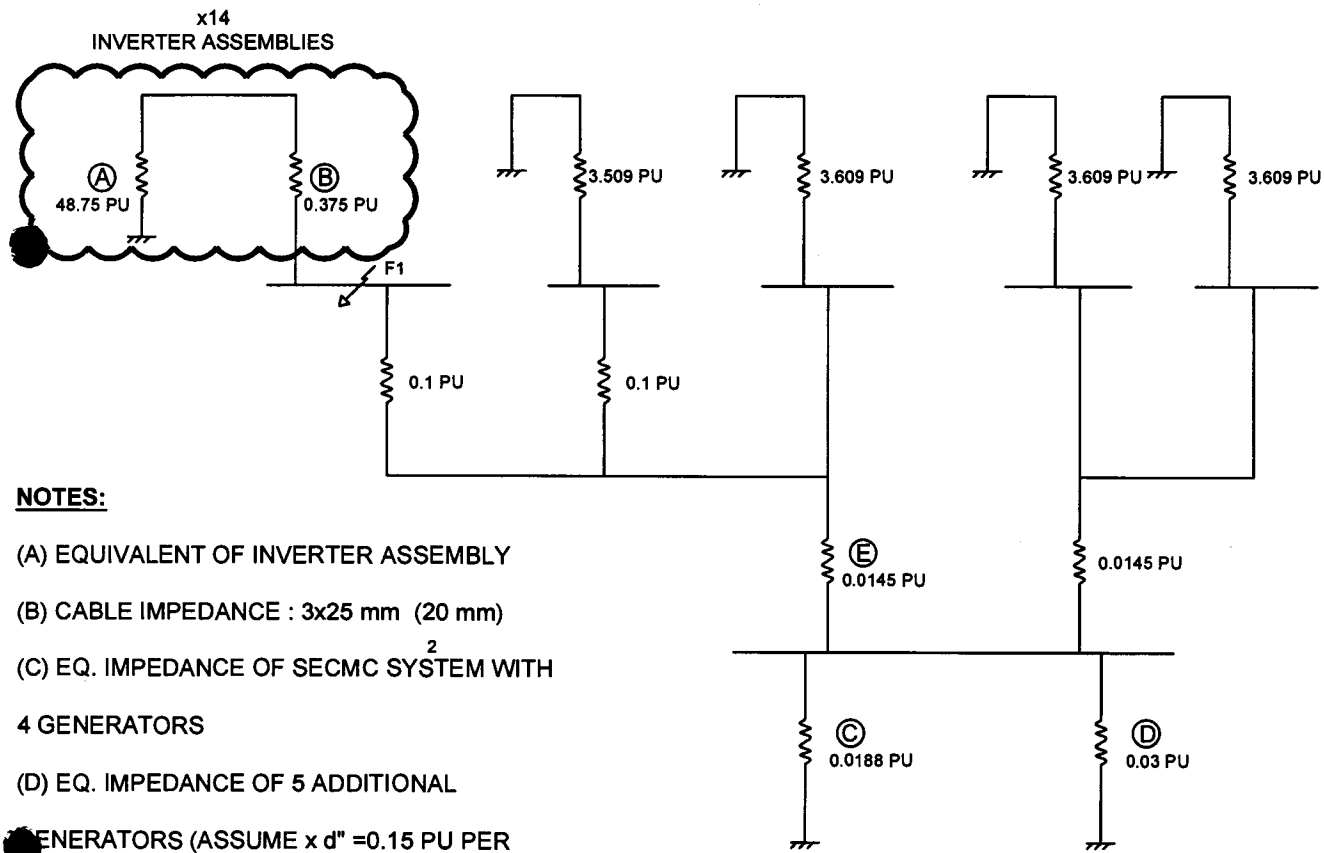
For Short Circuit Calculations at 11 kV Solar Power Switchboard please see Reactance Diagram. Sketch SK-05 (Appendix B).

Also see Overall Electrical Single line Diagram, Sketch SK-06 (Appendix C).

4.0 CONCLUSION

Based on the information provided by SECMC, at the 400 V Solar Power LV Panel, the calculated Short Circuit Value is 41.24 kA

Also, at the 11 kV Solar Power Switchboard, the calculated Short Circuit Value is 21.6 kA.



NOTES:

(A) EQUIVALENT OF INVERTER ASSEMBLY

(B) CABLE IMPEDANCE : 3x25 mm^2 (20 mm)

(C) EQ. IMPEDANCE OF SECMC SYSTEM WITH 4 GENERATORS

(D) EQ. IMPEDANCE OF 5 ADDITIONAL GENERATORS (ASSUME x d" =0.15 PU PER GENERATOR)

(E) OVERHEAD LINE IMPEDANCE

STEP NO-01
REACTANCE DIAGRAM

SK-01

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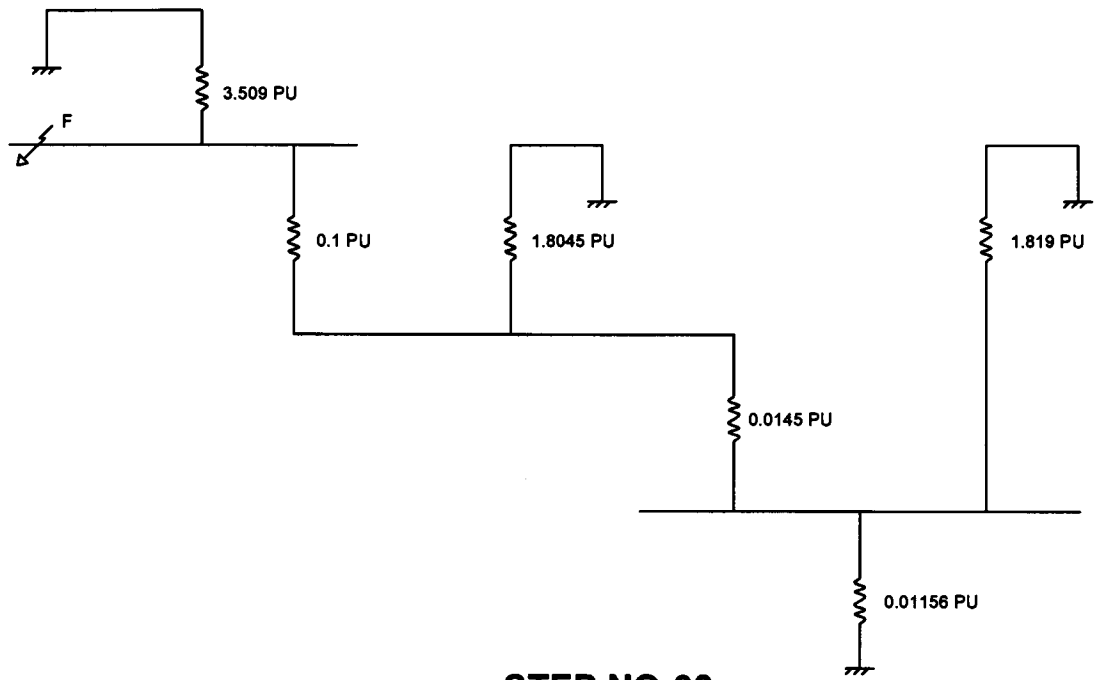
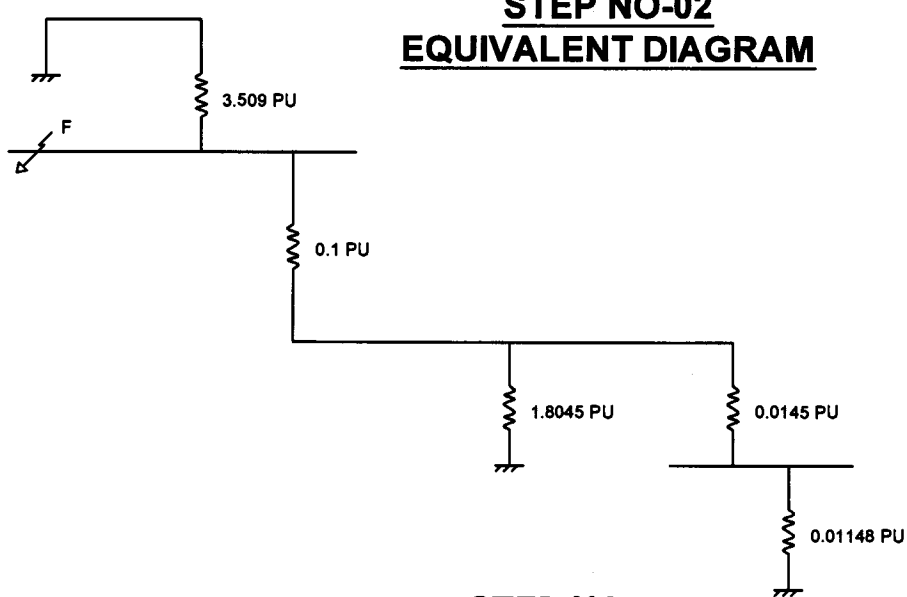


STEP NO-02
EQUIVALENT DIAGRAM



STEP NO-03
EQUIVALENT DIAGRAM

SK-02

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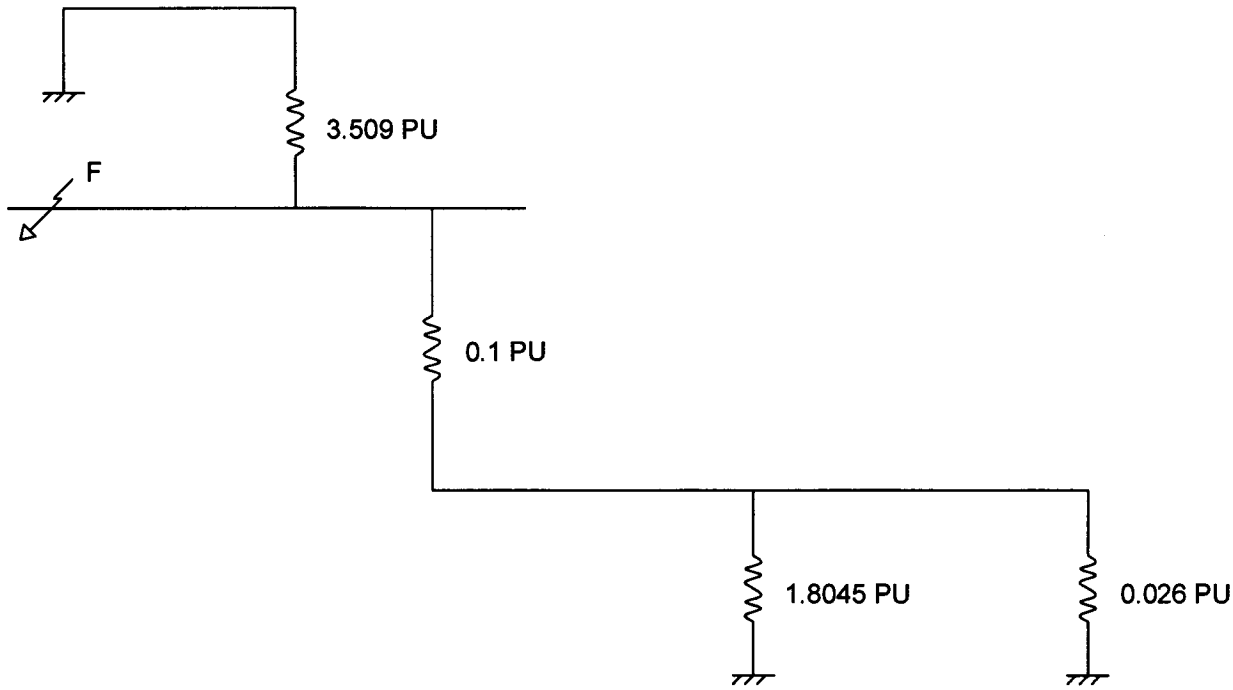
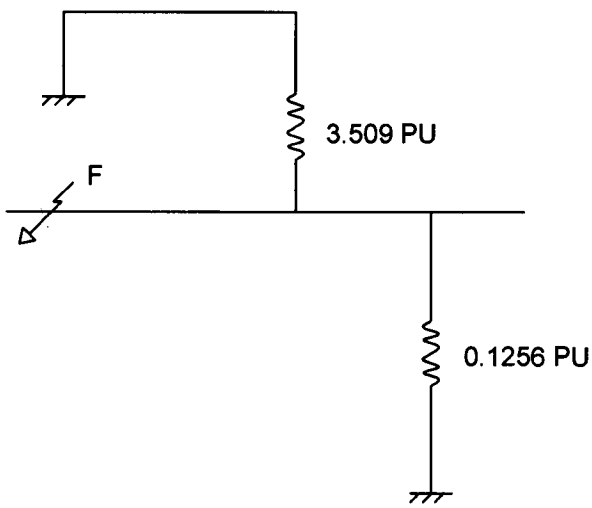


STEP NO-04
EQUIVALENT DIAGRAM



STEP NO-05
EQUIVALENT DIAGRAM

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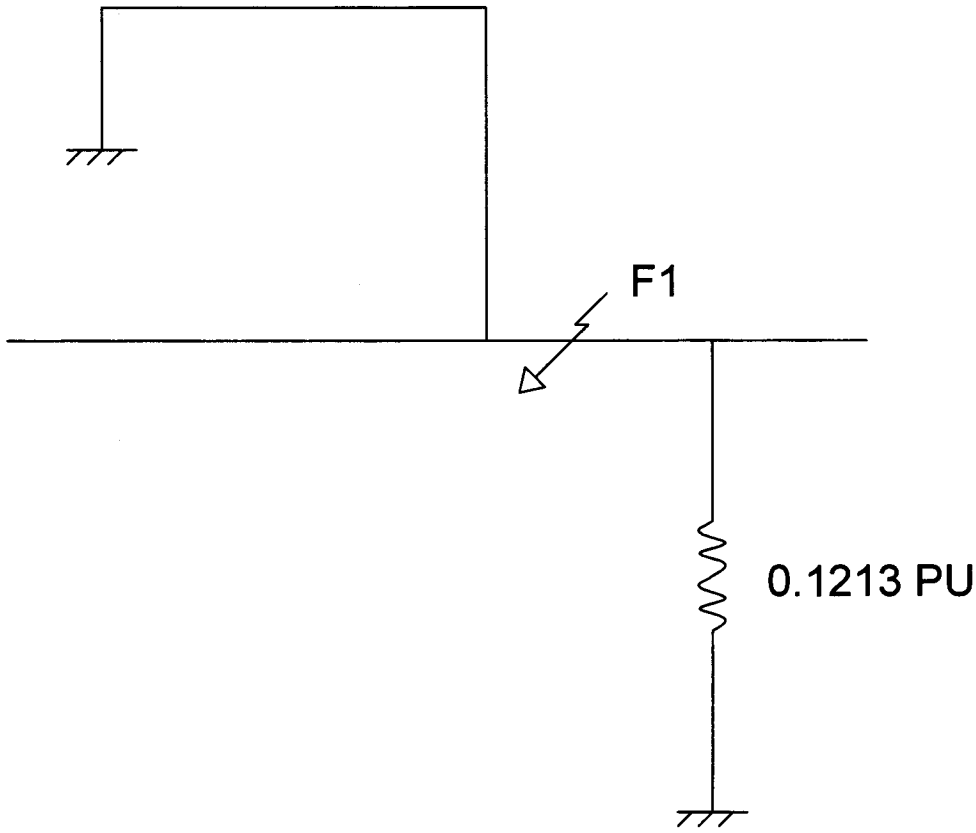
SK-03



$$Z_F = 0.1213 \times 0.08\ \Omega$$
$$= 0.0097\ \Omega$$

$$I_{F1} = \frac{0.4\ KV}{0.0097\Omega}$$
$$= 41.24\ KA$$

STEP NO-06
EQUIVALENT DIAGRAM

SK-04

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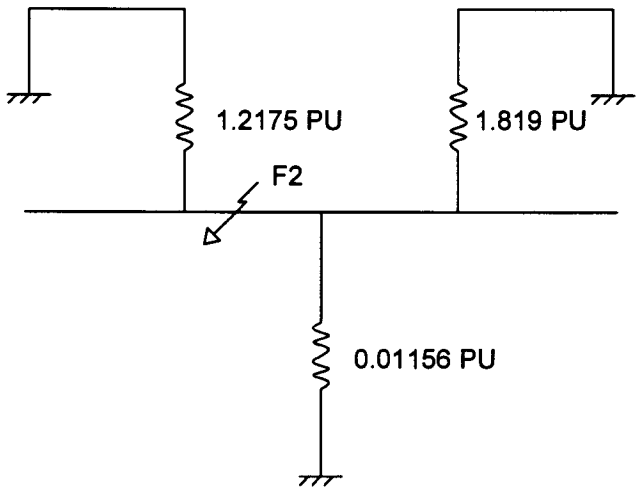

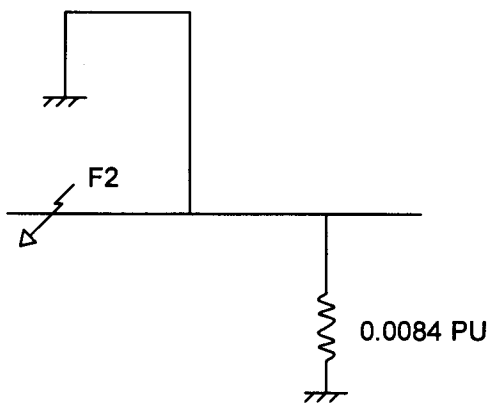

$Z\ \Omega = 60.5 \times 0.0084\ PU$

$= 0.5081\ \Omega$

$I_{F2} = \frac{11\ KV}{0.5081\ \Omega}$

$= 21.6\ KA$

REACTANCE DIAGRAM
11KV SOLAR POWER SWITCH BOARD

SK-05

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Plant Characteristics

Generation Voltage:

Solar Power plant will be generating AC power at Low voltage levels of 400V 4W+PE system. Low voltage level will then step up through power transformers to the existing Diesel Genset Voltage levels i.e. 11KV to be synced with Electrical Network.

Power Factor & Frequency

SECMC 5MW solar power plant is using solar grid connected string Inverters of 60KW each to covert DC power of solar panels to Alternating Power. Grid connected inverters have the functionality to adapt the power factor of existing diesel genset grid. The range of Power Factor can be set from 0 – 1 leading /lagging, making it suitable for absorbing or delivering reactive power. the nominal power factor for Inverters is 0.995. Nominal Frequency of generation is 50Hz.

Automatic Generation Control & Ramp Rate:

The Automatic Sustainable Controller (DEIF ASC-4) is a controller designed to serve as a link between sustainable power plant (Solar) and genset plants, combining them so they work as one common hybrid system. The concept of the ASC-4 is to maximize sustainable power penetration, depending on the total load demand to the hybrid without compromising constraints such as minimum genset load demand.
The ASC-4 Solar is the variant designed for PV control, and it enables integration of PV power and genset power. The PV plant is handled as a base loading power- and reactive power provider, not as a voltage- and frequency provider. Therefore, the ASC-4 only operates the PV in case either utility or a genset constitutes a grid to which the PV can dispatch power.

Ramp rate of inverters is the function of MPPT algorithm. Normally solar power is set to ramp up or ramp down the generation within the period of 5-10 seconds from 0 – 100 percent. Ramp rate can be adjusted according to the behavior of gensets over loading and unloading due to Solar power variations.

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Metering and Protection

The distance between solar field and point of common coupling (POCC) has been calculated as 2 kilometers approximately. The metering of solar units will be performed at the main 11KV load bus bar. It is designed that all auxiliary loads will be connected before the point of connection to get the true reading for energy being evacuated into the diesel gensets' grid for mine loads.

Sensitivity Class for meter is 0.5s with bidirectional 4 quadrant calculations algorithm. Features including, total import and export units can be extracted over the period, TOD calculations, MDI, active and reactive power calculations, Et al.

5 MWp Solar power plant will be terminated on a single RMU unit having following protections for the line and load side;

- Over and Under voltage protections
- Short Circuit protections
- Earth Fault detection
- Over current protection
- Emergency system shutdown protection.

Training and Development

ORIENTATION, SITE HSE INDUCTION AND OTHER TRAINING ACTIVITIES

Initial HSE Orientation Program

Each and every person will undergo a HSE orientation program. On completion of orientation he will be permitted to enter the site.

REON Site Engineer HSE with the help of CUSTOMER HSE personnel shall perform the initial orientation based on but not limited to the following:

- Explaining REON HSE Policy and organizations of REON site and CUSTOMER.
- General HSE rules and regulations for working on site including use of Personal Protective Equipment, incident reporting, getting first aid, emergency response (alarm system, escape route, assembly point), HSE inspection, housekeeping, etc.
- Hazards at construction site
- Environmental hazards

Note:

This Initial HSE Orientation would also be given to all the workers of the sub-contractors working at site.

Site Engineer HSE will keep a record of staff having completed induction.

Specific Induction for Workers (On Job)

Subsequent to the general induction first line supervisor shall conduct a specific orientation for new staff, which would comprise:

- Introduction of the workers on the nature of their jobs.
- Explaining to the workers the work environment of a particular location and specific job hazards

Permit to Work System Course

- It is mandatory for all work permit recipient and signatories to attend a permit to work course held by CUSTOMER. Work permits will often be required prior to commencement of work.
- Refresher courses will be arranged by REON HSE.

Tool Box Talk by Line Supervisors

All supervisors will be trained to deliver daily tool box talk in their respective areas.

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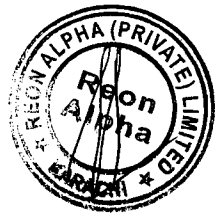
- Subjects for "tool box talks" would be selected to reflect the specific hazards of a particular site, feedback from first line supervisors/ HSE inspectors and observation / input from any other employee.
- Incidents, which may occur in the site/works, shall also be discussed in "tool box talks".
- Records of "tool box talks" shall be maintained by site HSE supervisor.

Management Employees Training Program

- The management employees training program will be conducted during the project to ensure that all management employees are trained.
- Site HSE Engineer will conduct HSE trainings for all staff based on training plan.

Task Specific Training Courses (Whenever Required)

In addition to the above, specific training courses shall also be provided for staff and workers Subjects for the training courses will be identified in the training plan as advised by the CUSTOMER.

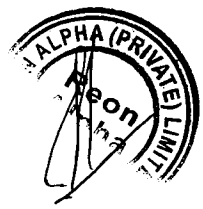


FEASIBILITY REPORT

SECMC 5MW Solar Power Plant

Executive Summary:

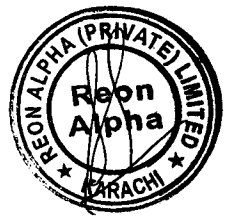
SECMC Solar Solution is a 5MW PV- Diesel Hybrid Power Plant which is to be installed near Mining Area of Sind Engro Coal Mining Company. The DC installed capacity of the plant is proposed by critically analyzing the current load and future load projections of the site. Main objective of this Solar plant is to provide smooth energy production from solar plant and keep generators to running above their minimum load threshold to avoid aging, thermal fatigue and over excitation of generators due to power flow through solar system.



Introduction:

This report has the objective to assess the feasibility of this project and is structured as follows:

- Introduction to Solar
- Solar Potential in Pakistan
- Project Overview
- Site Overview
- Conceptual Design
- Environmental Benefits
- Socio Economic Benefits
- Technical Summary



Introduction to Solar:

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system.

As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale solar power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun.

The productivity of solar power in a region depends on solar irradiance, which varies through the day and is influenced by latitude and climate.

The locations with highest annual solar irradiance lie in the arid tropics and subtropics. Deserts lying in low latitudes usually have few clouds, and can receive sunshine for more than ten hours a day. These hot deserts form the Global Sun Belt circling the world. This belt consists of extensive swathes of land in Northern Africa, Southern Africa, Southwest Asia, Middle East, and Australia, as well as the much smaller deserts of North and South America. Africa's eastern Sahara Desert, also known as the Libyan Desert, has been observed to be the sunniest place on Earth according to NASA.

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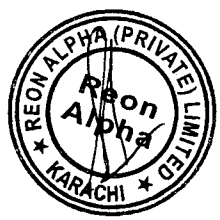
Solar Potential in Pakistan:

Increasing demand of power in the domestic, commercial and industrial sectors as Pakistan's population and its economy continue to expand—with annual GDP growth forecasts averaging 6 percent for the medium term. Currently, electricity consumption is severely suppressed by supply shortfalls and persistent load shedding, and there also exist significant levels of latent demand in the country as rising income levels allow more people to switch to electricity from using traditional fuels. The validity of the assumption that electricity use in Pakistan remains constrained due to availability—rather than access—issues is borne out by the fact that the penetration of the power network in the country is the highest in the South Asian region at 93.6 percent, as compared to 88.7 percent in Sri Lanka, 78.7 percent in India, 76.3 percent in Nepal, and 59.6 percent in Bangladesh.

Pakistan's per capita electricity consumption is currently significantly lower in comparison to other countries in a similar development stage, and much below that of OECD countries. Per capita electricity consumption is strongly correlated with the human development index (HDI), and the current trends of rising incomes and energy supplies, falling poverty levels, and increasing economic activity are predicted to lead to rapid increases in per capita consumption rates in Pakistan, creating a healthy demand for additional power generation.

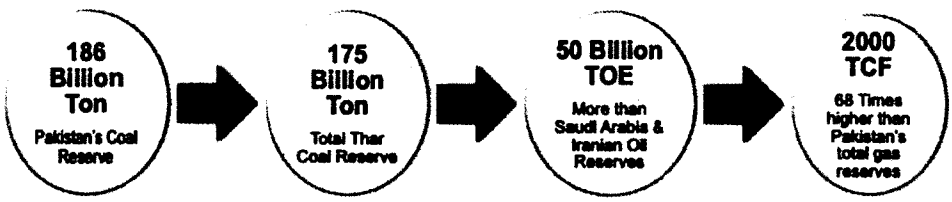
Even with the projected surplus in power generation capacity by 2020, there will still be sufficient economic feasibility for small and medium-sized (50-100 MW) renewable energy-based power projects in the Pakistan, especially those located near remote and isolated load centers and extremities of the grid network, or based on bilateral bulk contracts or for augmenting peak supplies on the grid. The viability of such projects will be further enhanced by the continued decline in technology prices and the emphasis by the government on indigenous energy resources that also help the country meet its environmental objectives and reduce carbon emissions.

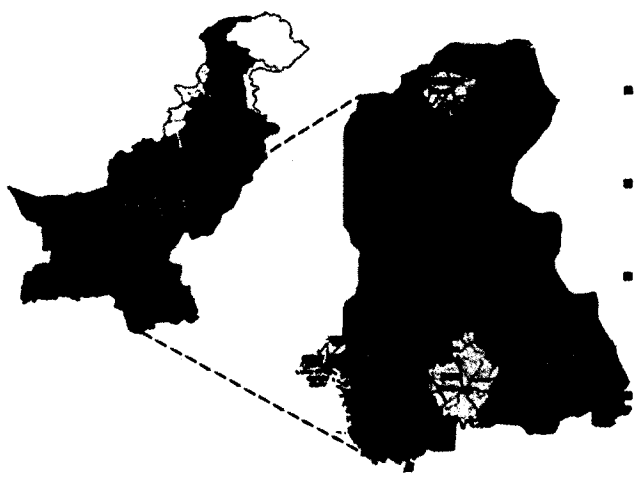


Project Overview:

Sindh Engro Coal Mining Company Limited (SECMC) hereinafter referred to as the 'Owner' is a joint venture of Engro Powergen Limited & Affiliates and Government of Sindh. SECMC is working on the development of an Open Cast Lignite Mine and in Thar Block-II to support future energy needs of Pakistan. SECMC has been granted a 30 years Mining Lease for Thar Block-II by Mines & Minerals Development Department, Government of Sindh and has signed a Coal Supply Agreement in Thar Block II with Engro Powergen Thar (Pvt) Limited (EPTL) for supplying 3.8 mtpa coal for 30 years. EPTL is setting up a 2 x 330 MW Mine Mouth power plant. In addition, SECMC has also started work on the expansion of the mining capacity from current planned capacity of 3.8mpta.

Thar Desert contains the world's 7th largest coal reserves:





- Thar Lignite – 94% of Pakistan's Total Coal Reserves
- Total area 9,000 km² divided into 13 blocks
- Thar Block II has been allocated to SECMC which contains 2 Billion tons of Lignite
- 1.57 Billion tons are exploitable enough to produce 5,000 MW for 50 years!

SECMC will execute the project in three phases. The first phase of the Project is underway, in which, two 330 MW sub critical plants will be established with majority share of Engro Powergen.

In the second phase the mine will be further expanded to 7.6 MTPA and additional 2 x 330 MW will be added. Subsequently, the mine will be taken to its potential of approx. 23 MTPA capable of generating approx. 3,960 MW

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Project Rationale:

- During the earlier years the power requirement will be fulfilled by Diesel Generation.
- When the grid will be available, the energy mix will include diesel generation and grid power. The current power generation is not only expensive but also hedged to volatile global oil prices.
- The diesel fuel is an external resource for Thar and Pakistan which is expensive for its operation compared to solar power. The idea is to increase local indigenization.
- The Mining company requires Power primarily to supply electrical equipment such as coal handling system, MSF, Pumps, Lighting, Telecommunications, Water treatment system etc.
- Additionally the mine will require incremental power during expansion phase.

A Request for Proposal ("RFP") was floated for proposals for the 'Rental Power Generation from Solar Energy for Mining and Related Activities'.

The bidder shall procure, install, construct and operate Solar Power Generation facility for the nameplate capacity of 5 MW and SEMC will have the option to extend it during or after the Project and operate it for the period of 15 (fifteen) years and then hand over the operations to Company. The Company at its sole discretion may allow Bidder to continue O&M renewed on yearly basis for the period of further 10 (ten) years. Bidder will ensure Solar system has a warranty of atleast twenty-five (25) years and will provide the same to Company

DLL was awarded the project after coming the lowest in a competitive bidding. A project company REON Alpha (Pvt) Limited which is 100 % owned by DLL has been setup for this purpose.

Technology

- Solar based Power Generation System, civil structures and Auxiliaries.
- Complete Solar Based Power Generating Panels with their protection, instrumentation, monitoring, control and synchronizing panels with existing DG sets.
- 11kV Cables for interconnection with the 11kV Switchgear located in a separate building as shown in the drawings attached hereto as well as various control cables required within the Power Plant or external to it for interfacing 11kV Switchgear or sensors or any other sub-systems including cable trenches, raceways, etc.
- All technical parameters including but limited to Net Efficiency, Net Output, Power Plant Availability, Construction of Power Plant Building including all facilities as well as all related sub-systems such as:
    - Plant Ventilation and air-conditioning in office and similar areas,
    - Electrification and lighting systems
    - c. Emergency Lighting System, etc.
    - d. Fire Protection System w.r.t NFPA Standards

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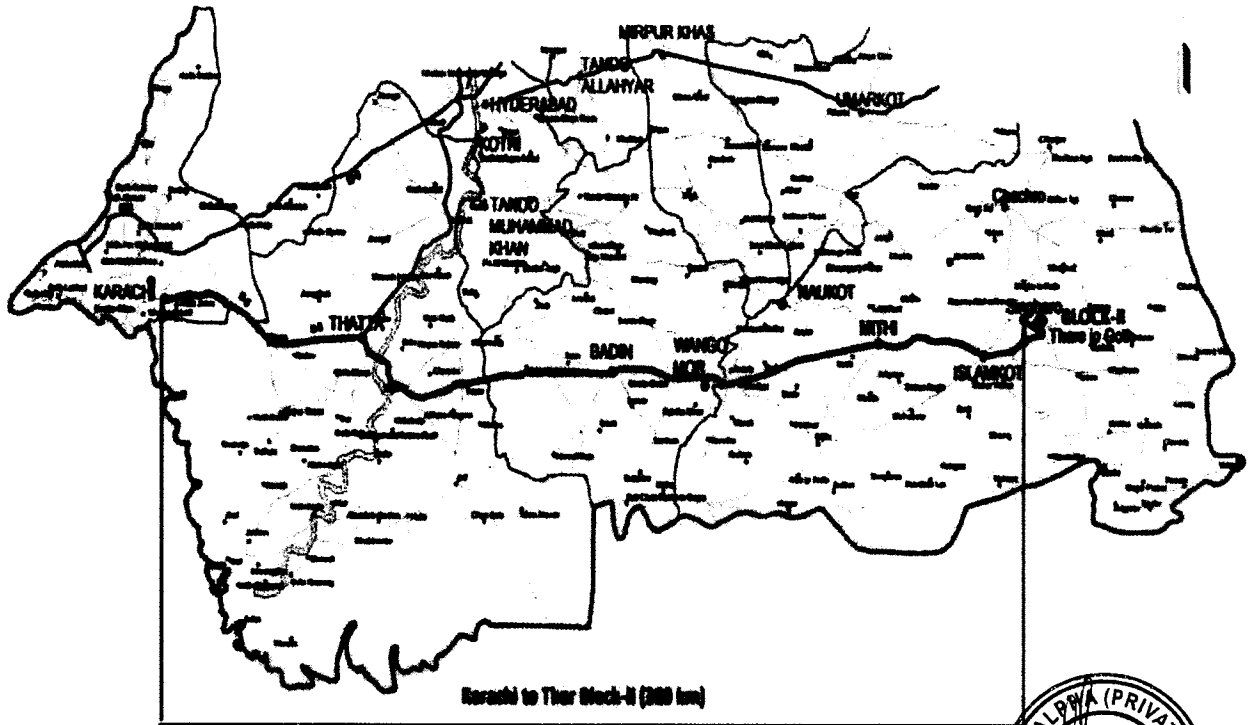
- Service transformer (11/0.415kV) for all power, lighting and other needs of the Power Plant, etc. including all LV switchgear and control gear, wiring, etc.
- All ancillary equipment such as cooling towers, related pumps, etc.
- The installed system shall meet applicable codes and standards. Safety signage and labelling should be mounted on the system as required
- All Solar Panels shall be made of Crystalline Silicon solar cells
- Contractor must install PV modules of highest efficiency in consideration with Solar map of Thar to utilize the day time effectively in all weather conditions.
- All the electrical installations and wiring for the PV system in accordance with codes and standards

Project Location

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot.

The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure 1.4-2 indicates both alternative routes.

ROUTE MAP : KARACHI TO THAR BLOCK-II



Operations and Maintenance Costs

The project also includes 24/7 O&M of the complete Power Plant including all its related systems and equipment. The O&M services shall be carried out for a period of 15 years (180 Months) and shall include but not be limited to the following items and their related costs, inclusive of all importation and local charges, duties, taxes, etc.

- Provision of all manpower as duly approved by the Company.
- Provision of all consumable material and parts.
- Provision of all routine and preventive maintenance parts. (Bidders are required to provide a priced list).
- Full costs relating to any repairs and replacements due to defects in the or break down of the equipment and systems strictly in accordance with OEMs requirements. The cost shall also include all dismantling, handling, shipment, etc.
- Provision of all lubricating oils, greases, coolants, rust inhibitors, and any other items as recommended by the original equipment manufacturers (OEMs).
- Provision of all emergency spare parts as per the recommendations of the OEMs or as directed by the Company. (Bidders are required to provide a priced list).
- Capital and Operational spares for 02 years to be kept in the inventory which will handed over to Company at the end of the Project.

It's specifically pointed out that the O&M shall also be inclusive of following as incurred throughout the O&M contract period

- Vehicles and their drivers for travel within and outside the Project site, including purchase, insurance, taxes, etc. relating to vehicles, their O&M and safety.
- All return travel costs of Bidder's personnel coming from abroad.
- Medical expenses, insurance, etc. as required on Bidder's personnel.
- Regular monitoring of requirements of all necessary items for O&M and arrangements for their timely availability at site.
- Reporting to company on all aspects of Power Plant operation and performance.

Feasibility & Financing:

The Project will cost approximately **PKR Four Hundred and Thirty One Million, Five Hundred and Ten Thousand**

Total Major Components Cost	**280,884,031**
Total Local Supply and Service Cost	**121,895,590**
Total Reon Service Charges	**13,646,666**
O&M Equipment	**15,083,880**
Total - PKR	**431,510,167**

Whilst the sponsors (DLL) has one of the strongest balance sheet from any corporate in Pakistan and can finance the project on 100% equity it is expected to be funded from a combination of Equity and Debt as the group as adequate banks lines.

This group has running finance facilities obtained from the financial institutions of Rs 1,150,000 (2015: Rs. 650,000) under a mark-up arrangement. The facilities are subject to markup ranging from 3 months KIBOR + 0.90% to 1% which is determined at the start of each quarter and is payable on quarterly basis in arrears. The running finance under mark-up arrangement is secured by way of deposit of title deeds of land and pledge over Company's investment in related parties.

(Reported in Last Annual Accounts of 2016)

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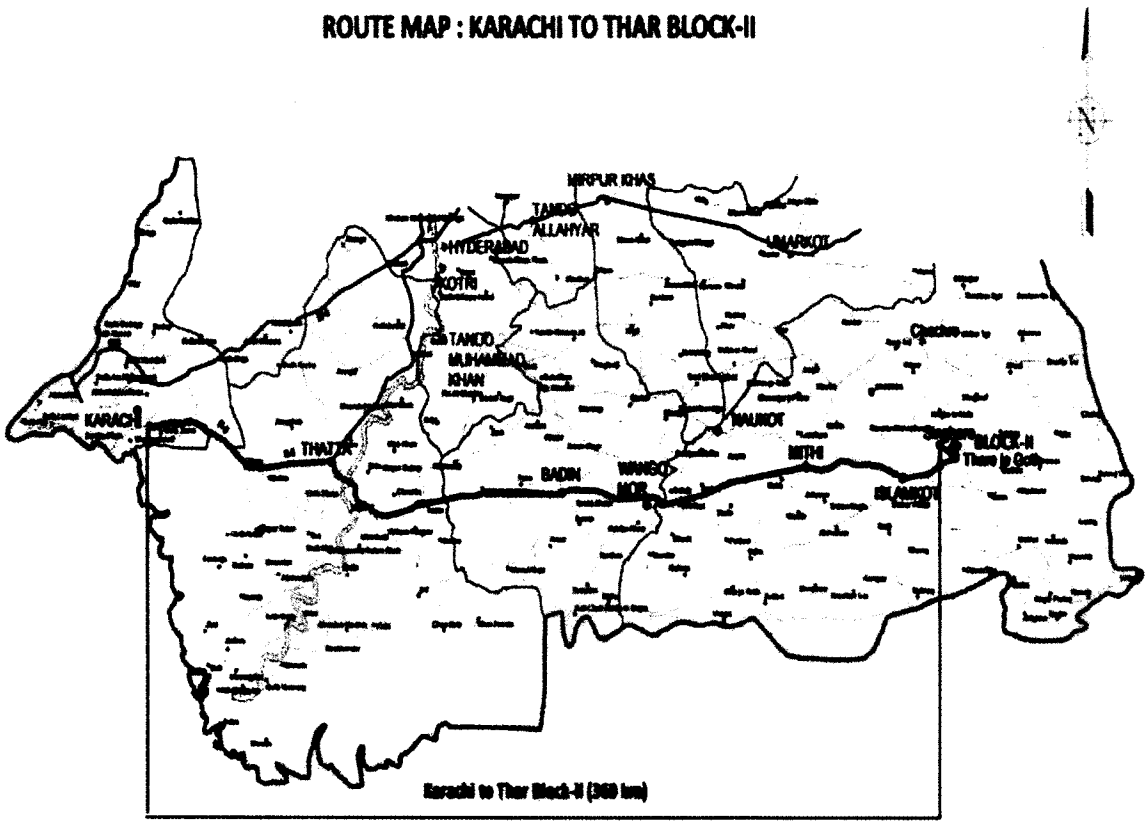
Site Overview:

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot.

The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure indicates both alternative routes.



It is subtropical desert climate in Thar Coalfield, dry, little rain, monsoon ravaging and hot in summer and autumn.

Average monthly temperature for every year in Thar desert:

The lowest is 15°C （January 1984）; the highest is 34.7°C （May 1994）.

Average monthly temperature for 30 years:

the lowest is 16.4°C （Jan), the highest is 33.8°C （Jun)

The annually average temperature is 25.6-27.3°C, while the extreme high temperature can reach 51°C.

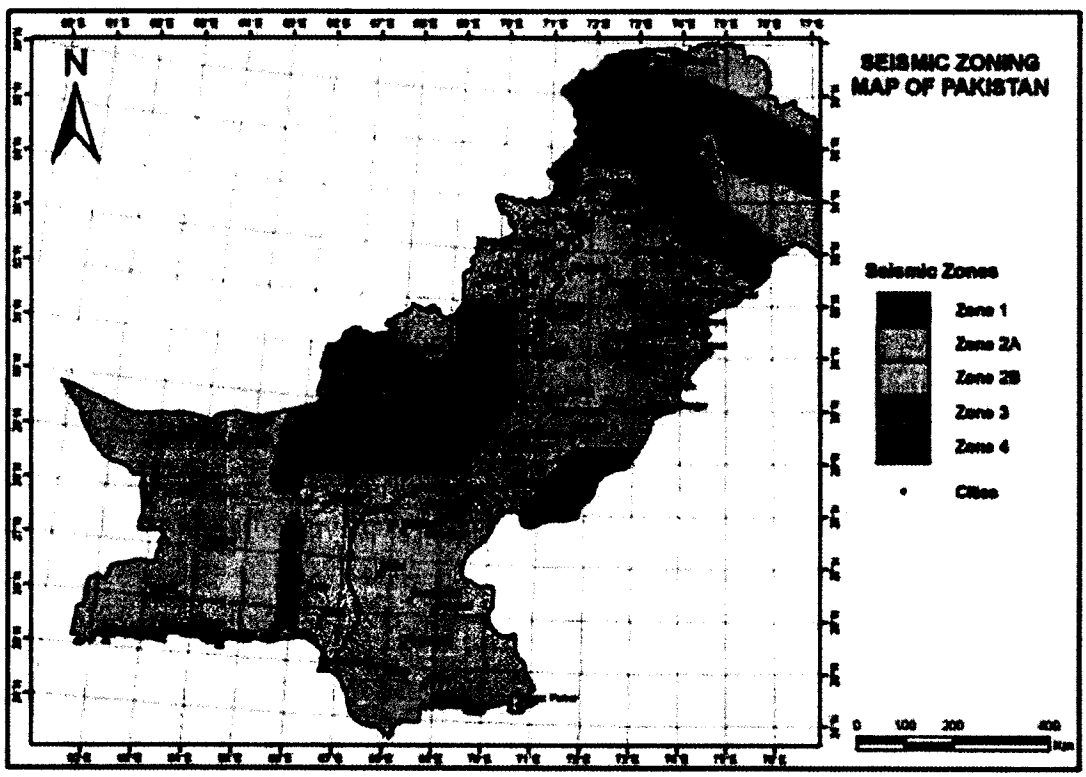
Thar area is in a semiarid subtropical zone with low Monsoon rainfall. Generally, most of the rainfall comes in July and August; November, December and January have the lowest monthly rainfall, with mostly 0 mm. The highest measured monthly rainfall is 778.1mm (September 2011). Average monthly rainfall of 37 years varies from 0.60mm (December) to 113.37mm

(August). Total minimum annual rainfall is 4.6mm （2002） and maximum is 1361.3mm （ 2011), with an average of 288.71mm.

As the area is semiarid, the humidity is low. The humidity is lower in winter while higher in summer, due to the summer rains. The average monthly humidity varies from 13% （Mar 1973） to 78% （Aug 1994）. Average annual humidity is 28.4% （1974） - 42.1% （1999）. 30 years average monthly humidity is 25% （Apr） - 40% （Aug).

The wind speed in Thar Desert area is higher in summer while lower in winter. This is due to the summer Monsoon. Lowest monthly wind speed is 0.6 knot (Dec 2004), and the highest is 21.1 knot （May 2006）. From April to September, wind speed is at around 6.45-10.48 knots. In May, Jun and July the wind speed reaches its highest velocity with more than 10 knots. During the rest of the year, the wind speed is low at about 2.45-4.83 knot.

The peak acceleration for earthquake in the block II is 0.2g, belonging to Magnitude VIII seismic fortification. Please refer Figure, Seismic Intensity Distribution of Pakistan, for more about the seismic intensity in the mining area.



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Environmental Benefits:

This system will help substitute the main generation source i.e. Diesel, hence curtailing the emissions. Annual CO_2 emission reduction is 5,123 metric tonnes per year. This is equivalent to the CO_2 sequestration done by planting 256,150 trees per year.

A life cycle assesment of the CO2 produced by solar PV is 40g per kWh as opposed to 700g CO_2 per kWh for diesel fuel.

Reference: Life cycle greenhouse gas emission of energy sources

https://en.wikipedia.org/wiki/Life-cycle_greenhouse-gas_emissions_of_energy_sources

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Socio Economic Benefits:

Renewable energy technologies have experienced rapid deployment over the past few years, mainly driven by the ambition to improve energy security, enhance energy access and mitigate climate change. Many countries are now exploring ways to stimulate social and economic growth through the development of the renewable energy sector. Investment in renewable energy can generate new sources of growth, increase income, improve trade balances, contribute to industrial development and create jobs.

Upon commissioning of a solar project, the economic benefit of the solar plant starts with the savings on foreign exchange for import of fossil fuel. Other benefits include the utilization and employment of local manpower.

This project will ensure that local manpower of Thar would be utilized for semi-skilled and non-skilled applications, even the training of this manpower would be ensured.

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Conceptual Design:

Generation Voltage:

Solar Power plant will be generating AC power at Low voltage levels of 400V 4W+PE system. Low voltage level will then step up through power transformers to the existing Diesel Genset Voltage levels i.e. 11KV to be synced with Electrical Network.

Power Factor & Frequency

SECMC 5MW solar power plant is using solar grid connected string Inverters of 60KW each to covert DC power of solar panels to Alternating Power. Grid connected inverters have the functionality to adapt the power factor of existing diesel genset grid. The range of Power Factor can be set from 0 – 1 leading /lagging, making it suitable for absorbing or delivering reactive power. the nominal power factor for Inverters is 0.995. Nominal Frequency of generation is 50Hz.

Automatic Generation Control & Ramp Rate:

The Automatic Sustainable Controller (DEIF ASC-4) is a controller designed to serve as a link between sustainable power plant (Solar) and genset plants, combining them so they work as one common hybrid system. The concept of the ASC-4 is to maximize sustainable power penetration, depending on the total load demand to the hybrid without compromising constraints such as minimum genset load demand.
The ASC-4 Solar is the variant designed for PV control, and it enables integration of PV power and genset power. The PV plant is handled as a base loading power- and reactive power provider, not as a voltage- and frequency provider. Therefore, the ASC-4 only operates the PV in case either utility or a genset constitutes a grid to which the PV can dispatch power.

Ramp rate of inverters is the function of MPPT algorithm. Normally solar power is set to ramp up or ramp down the generation within the period of 5-10 seconds from 0 – 100 percent. Ramp rate can be adjusted according to the behavior of gensets over loading and unloading due to Solar power variations.

Metering and Protection:

The distance between solar field and point of common coupling (POCC) has been calculated as 2 kilometers approximately. The metering of solar units will be performed at the main 11KV load bus bar. It is designed that all auxiliary loads will be connected before the point of connection to get the true reading for energy being evacuated into the diesel gensets' grid for mine loads.

Sensitivity Class for meter is 0.5s with bidirectional 4 quadrant calculations algorithm. Features including, total import and export units can be extracted over the period, TOD calculations, MDI, active and reactive power calculations, Et al.

5 MWp Solar power plant will be terminated on a single RMU unit having following protections for the line and load side;

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- Over and Under voltage protections
- Short Circuit protections
- Earth Fault detection
- Over current protection
- Emergency system shutdown protection.

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Company Prospectus

1. Company Background

The applicant REON Alpha is wholly owned subsidiary of Dawood Lawrencepur Limited ("DLL").

The Company, has been incorporated to provide power purchase agreements via solar solutions to private sector and public-sector customers in Pakistan by setting up Solar PV plants on the site of the customer by offering hybrid or grid tied solutions.

This allows savings on transmission infrastructures to the government of Pakistan and allows customers to take advantage of cheaper renewable power without having to undertake expensive Capex on its own accord as asking clients to undertake expensive capex on technology, which has capacity risk, has inhibited the growth of this industry in Pakistan even with all the great effort of NEPRA and Ministry of Water and Power to unlock the value of Solar in Pakistan.

Accordingly, the company has decided to apply for a generation license for its proposed project with Sindh Engro Coal Mine.

DLL already own Reon Energy Limited, a wholly owned subsidiary, which is one of the leading EPC (Engineering, Procurement and Construction) solution providers in Pakistan. These solutions include designing of system, procurement of material from distinct manufacturers and construction of complete PV System (on-grid and hybrid) to deliver cost effective & trustworthy solutions

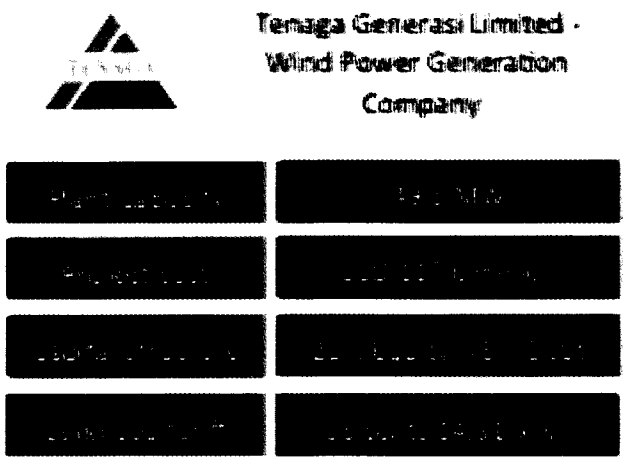
Projects have been delivered for a variety of customers, including Unilever Pakistan and Asia Petroleum Limited, with the biggest being a 1MW installation for Nobel Energy and recently inaugurated 1 MW at Servis industries. The Company is now recognized as the leader in high quality installations whilst providing customers with clean energy and minimizing their energy price risk.

The Company has focused on supply chain management and engineering collaborations to bring in efficiencies, which have ultimately benefited customers. The Company is now directing all focus to the high-growth areas in the solar energy space. Solar energy solutions help provide energy security and minimize energy costs for businesses. In addition, renewable energy addresses environmental concerns regarding carbon emissions and greenhouse

The company also owns 75% shareholding in Tenaga Generasi Limited, a subsidiary of Dawood Lawrencepur Limited, is an Independent Power Producer (IPP) project that consists of the construction, operation & maintenance of a wind farm & associated facilities in the province of Sindh, in south-eastern Pakistan. The Project is aimed at creating a better environment by lowering atmospheric emissions.

Tenaga Generasi Limited constructed and operates a 49.5MW Wind Energy Project, which is came online in late 2016.

Project Overview



The Wind project went online in October 2016 and is supplying electricity to the grid.

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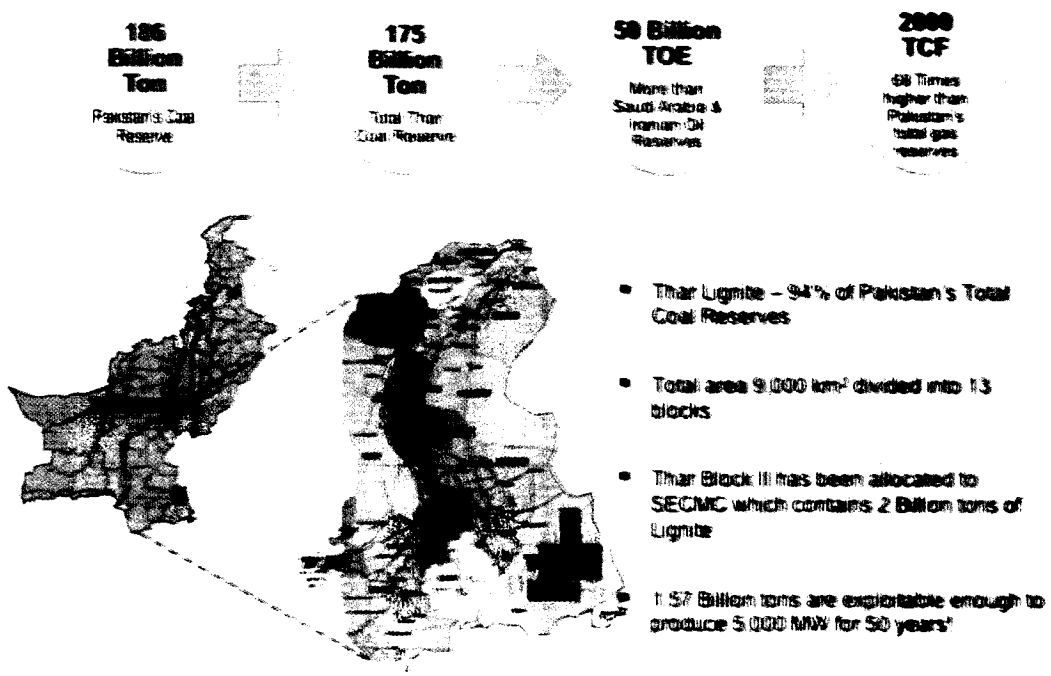
Tel: +92 42 3586 1050-53 Fax: +92 42 3586 1054
UAN: 111 736 611 Website: www.reonenergy.com Email: info@reonenergy.com

2. Project Brief:

Sindh Engro Coal Mining Company

Sindh Engro Coal Mining Company Limited (SECMC) hereinafter referred to as the 'Owner' is a joint venture of Engro Powergen Limited & Affiliates and Government of Sindh. SECMC is working on the development of an Open Cast Lignite Mine and in Thar Block-II to support future energy needs of Pakistan. SECMC has been granted a 30 years Mining Lease for Thar Block-II by Mines & Minerals Development Department, Government of Sindh and has signed a Coal Supply Agreement in Thar Block II with Engro Powergen Thar (Pvt) Limited (EPTL) for supplying 3.8 mtpa coal for 30 years. EPTL is setting up a 2 x 330 MW Mine Mouth power plant. In addition, SECMC has also started work on the expansion of the mining capacity from current planned capacity of 3.8mpta.

Thar Desert contains the world's 7th largest coal reserves:



SECMC will execute the project in three phases. The first phase of the Project is underway, in which, two 330 MW sub critical plants will be established with majority share of Engro Powergen
In the second phase the mine will be further expanded to 7.6 MTPA and additional 2 x 330 MW will be added. Subsequently, the mine will be taken to its potential of approx. 23 MTPA capable of generating approx. 3,960 MW

3. Project Rationale:

- During the earlier years the power requirement will be fulfilled by Diesel Generation.
- When the grid will be available, the energy mix will include diesel generation and grid power. The current power generation is not only expensive but also hedged to volatile global oil prices.
- The diesel fuel is an external resource for Thar and Pakistan which is expensive for its operation compared to solar power. The idea is to increase local indigenization.
- The Mining company requires Power primarily to supply electrical equipment such as coal handling system, MSF, Pumps, Lighting, Telecommunications, Water treatment system etc.
- Additionally, the mine will require incremental power during expansion phase.

A Request for Proposal ("RFP") was floated for proposals for the 'Rental Power Generation from Solar Energy for Mining and Related Activities'.

The bidder shall procure, install, construct and operate Solar Power Generation facility for the nameplate capacity of 5 MW and SEMC will have the option to extend it during or after the Project and operate it for the period of 15 (fifteen) years and then hand over the operations to Company. The Company at its sole discretion may allow Bidder to continue O&M renewed on yearly basis for the period of further 10 (ten) years. Bidder will ensure Solar system has a warranty of at least twenty-five (25) years and will provide the same to Company

DLL was awarded the project after coming the lowest in a competitive bidding. A project company REON Alpha (Private) Limited which is 100% owned by DLL has been set up for this purpose.

Reon

4. Technology

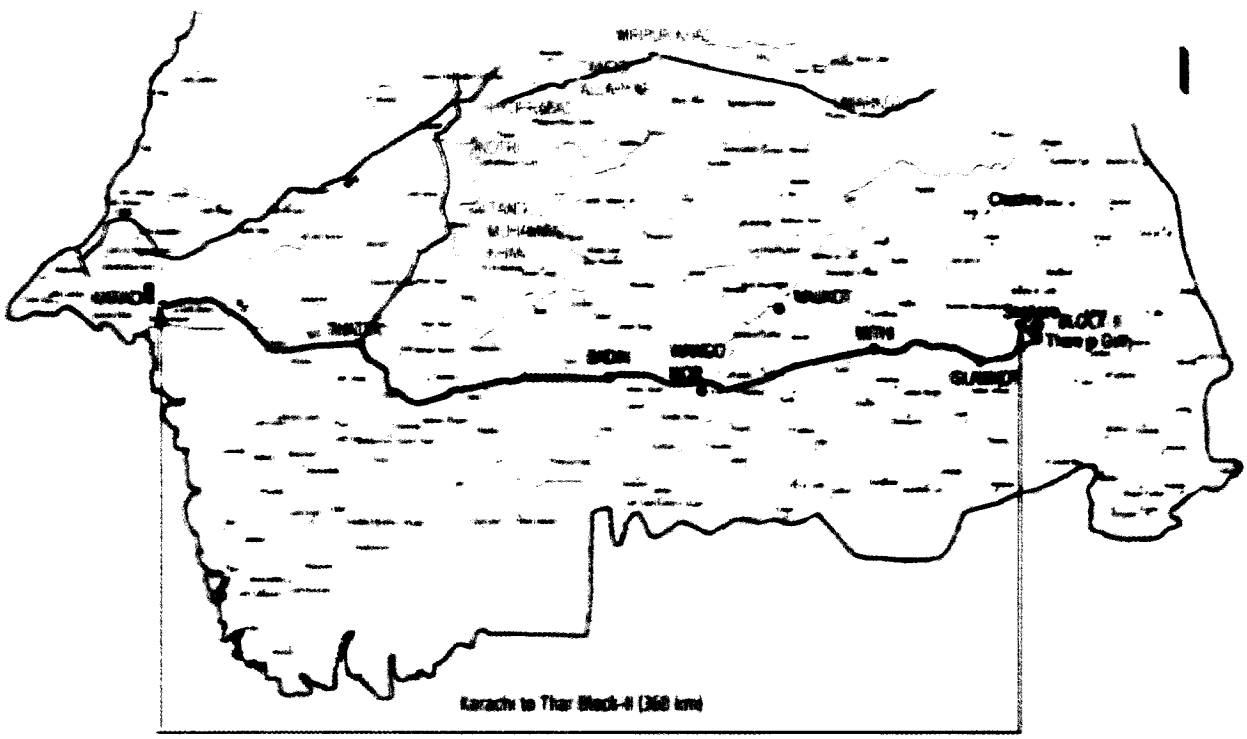
1. Solar based Power Generation System, civil structures and Auxiliaries.
2. Complete Solar Based Power Generating Panels with their protection, instrumentation, monitoring, control and synchronizing panels with existing DG sets.
3. 11kV Cables for interconnection with the 11kV Switchgear located in a separate building as shown in the drawings attached hereto as well as various control cables required within the Power Plant or external to it for interfacing 11kV Switchgear or sensors or any other sub-systems including cable trenches, raceways, etc.
4. All technical parameters including but limited to Net Efficiency, Net Output, Power Plant Availability, Construction of Power Plant Building including all facilities as well as all related sub-systems such as:
5.
6. a. Plant Ventilation and air-conditioning in office and similar areas,
7. b. Electrification and lighting systems
8. c. Emergency Lighting System, etc.
9. d. Fire Protection System w.r.t NFPA Standards

5. Service transformer (11/0.415kV) for all power, lighting and other needs of the Power Plant, etc. including all LV switchgear and control gear, wiring, etc.
6. All ancillary equipment such as cooling towers, related pumps, etc.
7. The installed system shall meet applicable codes and standards. Safety signage and labelling should be mounted on the system as required
8. All Solar Panels shall be made of Crystalline Silicon solar cells
9. Contractor must install PV modules of highest efficiency in consideration with Solar map of Thar to utilize the day time effectively in all weather conditions.
10. all the electrical installations and wiring for the PV system in accordance with codes and standards
11. Since designed without batteries, switching over mechanism to backup DG Genset to be provided by the Contractor.

5. Project Location

Thar Block-II covers an area of 95.5 km2 and is located in District Tharparkar approximately 380 kms from Karachi, 65 kms from Mithi and 20 kms from Islamkot. The area can be approached by road, using either the southern road via Badin/ Naukot or the northern via Hyderabad/ Mirpur Khas/ Naukot. Figure 1.4-2 indicates both alternative routes.

ROUTE MAP : KARACHI TO THAR BLOCK-II



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6. Operations and Maintenance Costs

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3. Provision of all routine and preventive maintenance parts. (Bidders are required to provide a priced list).
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7. Capital and Operational spares for 02 years to be kept in the inventory which will handed over to Company at the end of the Project.

It's specifically pointed out that the O&M shall also be inclusive of following as incurred throughout the O&M contract period

1. Vehicles and their drivers for travel within and outside the Project site, including purchase, insurance, taxes, etc. relating to vehicles, their O&M and safety.
2. All return travel costs of Bidder's personnel coming from abroad.
3. Medical expenses, insurance, etc. as required on Bidder's personnel.
4. Regular monitoring of requirements of all necessary items for O&M and arrangements for their timely availability at site.
5. Reporting to company on all aspects of Power Plant operation and performance.

6. Environmental Assessment Report

The site allocated is private land with the leaseholder Sindh Engro Mining Company, which has carried out a detailed environment assessment of the site in preparation of its coal mine and power plant (the detailed EIA can be shared if upon request).

The EIA was evaluated to further assess the impact of the proposed PV plant.

Overall Environmental Impact Findings

Environmental Parameter	Level of Impact	Reasons	Mitigation Measures
Air Impact	Low	No atmospheric Emissions from the process	Use of PV based solar power technology
Water	Low	Plant will require a very low amount of water No effluent is envisaged to be discharged from the plant that may have impact.	The project will be setting up an RO plant and a pond to store this water and this water will be used for the cleaning the modules. No effluent should be discharged.
Land	Low	Impact of change in land use.	Site selection has been made in consideration of SECMC identifying the land where it already holds the lease. CSR activity will be undertaken as agreed between the Company and community stakeholders.
Ecosystem	Low	As no ecologically sensitive place lies within 10 km	There is no significant vegetation cover within the selected area
Socio Ecosystem	Low	Total land identified for the project is barren land: No land acquisition is anticipated as this will be on private land may have socioeconomic impact.	Construction worked will be housed on temporary construction camps specially developed for this purpose with all basic amenities. CRS activities will help to improve the quality of life as well as education status of the nearby villagers

The assessment of the project has been considered for both positive and negative effects. The proposed photovoltaic power project has been located as per international guidelines. Adoption of green power generation technology for power generation with no emissions and effluent discharge will have least impact on the ambient environment and on the host community. However, in the long term the project and related activities in the area may bring about slight change in ambient air quality of the area.

Technical Summary:

- Polycrystalline 325W Solar Modules with efficiency 16.75% are used in the design
- 50 KW grid connected solar inverters, 400V three phase, 98.3% have been considered
- Step up Transformers 0.4 / 11KV ONAN are used
- Medium Voltage Switchgears 11KV / 630A
- System will be connected to 11KV Bus Bar of Diesel Generators
- DC/AC Ratio of 1.23 for Inverters has been considered
- Maximum AC output of the system is assumed to be 4050 KW
- Output of the system is based on instantaneous Irradiation values of Solar Energy
- 18 Acres of land area required for the installation of solar plant

Bill of Materials:

S. No.	Components	Qty (No.)
1	Polycrystalline Solar Modules 325W	15390
2	Grid Connected Solar Inverters 50KW 3 Phase	81
3	0.4 / 11KV Step up Transformers	5
4	Medium Voltage Switchgears	5
5	Diesel Gensets and Solar Energy Control System	1

Energy Generation:

S. No.	Efficiency Parameters	
1	Performance Ratio of the System	80.8%
2	Capacity Utilization Factor	17.9%
3	Energy Generation Units	7.85 Million KWh

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Efficiency Parameters

PV power plant efficiency can be judged per its performance ratio, expressed as a percentage. This ratio compares a plant's actual energy production to its theoretical energy-generating potential and describes how efficient a PV power plant is in converting sunlight incident on the PV array into AC energy delivered to the utility grid. AS per IEC definition, Performance Ratio defines as;

$$Performance\ Ratio = \frac{Z1}{Z2} \div \frac{Z3}{Z4}$$

Where,

Z1 = Accumulated electricity generated during testing period (KWh)

Z2 = Total system installed capacity (KWs)

Z3 = Accumulated irradiation during testing period (Wh/m2)

Z4 = Intensity of irradiance under STC condition = 1,000W/m2

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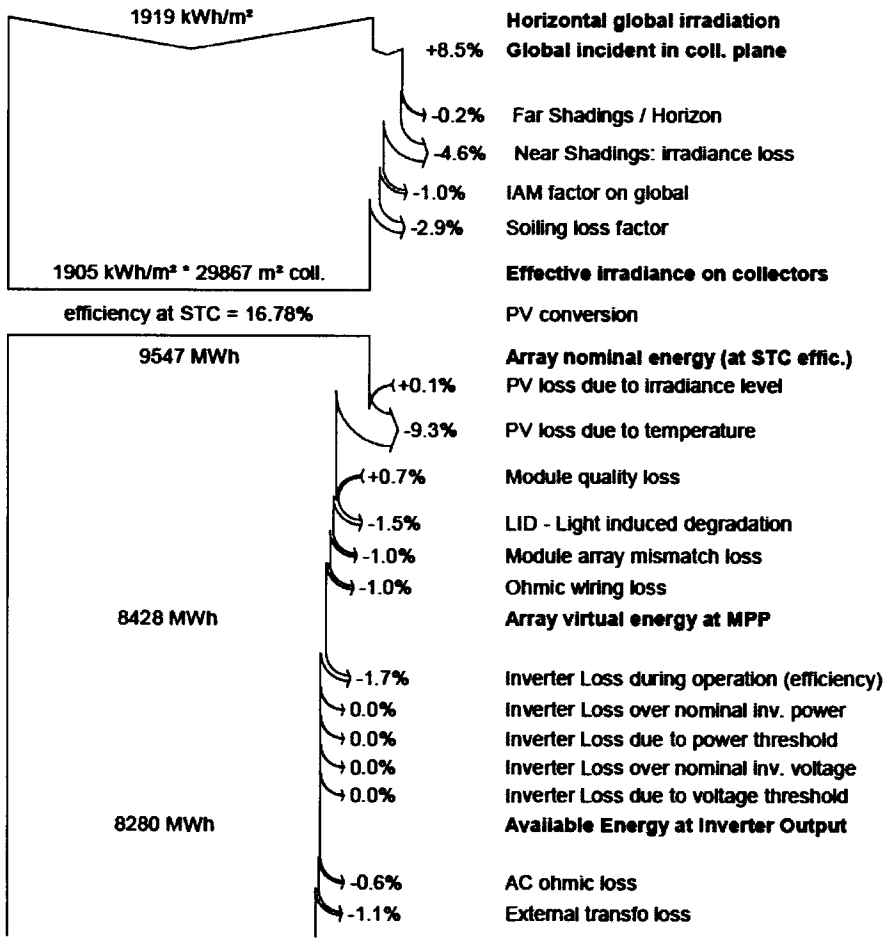
Loss diagram over the whole year



S. No.	Efficiency Parameters	
1.	Performance Ratio of the System	80.8%
2.	Capacity Utilization Factor	17.9%
	Energy Generation Units	7.85 Million KWh

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