

**APPLICATION
TO**



**NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
(NEPRA)**

By



RANIPUR ENERGY (PVT) LIMITED (REL)

**FOR
GRANT OF GENERATION LICENCE**

FOR 60 MW

NEW BAGASSE BASED HIGH-PRESSURE COGENERATION POWER PLANT

**AT TALUKA KOT DIGI, DISTRICT KHAIRPUR
SINDH, PAKISTAN**

Head Office

C-89, Kalkashan Scheme No.5
Block No. 2, Clifton, Karachi
Tel: +92-21-35291731-37

Ref. No.REL/NEPRA/007

Dated: May 25, 2017

The Registrar

National Electric Power Regulatory Authority
NEPRA Tower, Attaturk Avenue (East)
Sector G-5/ I, Islamabad

Subject: Application for a new Generation License for 60 MW Cogeneration Power Project by M/s Ranipur Energy (Pvt) Limited at Ranipur Sugar Mills (Pvt) Limited, Taluka Kot Digi, District Khairpur, Sindh, Pakistan

Dear Sir

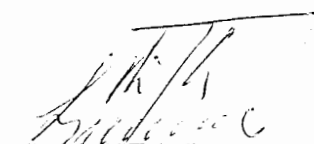
I, Liaquat Ali, Director, being the authorized representative of M/S RANIPUR ENERGY (PVT) LIMITED by virtue of Board Resolution dated May 23, 2017, hereby apply to National Electric Power Regulatory Authority for grant of Generation license to the RANIPUR ENERGY (PVT) LIMITED pursuant to section (3) 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 provision 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.

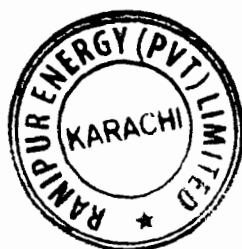
Bank Pay Order No.BC KSB 00000063 dated 25/05/2017 in the sum of Rs.375,420/- drawn at Bank Alfalah, Khayaban e Shamsheer Brach, Karachi being the non-refundable license application fee calculated in accordance with the schedule II to the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, is also attached herewith.

We shall be pleased to provide any further information you may require.

Regards,


(LIAQUAT ALI)

DIRECTOR
Authorized Signatory
For & on behalf of
M/s Ranipur Energy (Pvt) Ltd.



BANK DRAFT

Application Processing Fee

**EXTRACT OF RESOLUTION OF
THE BOARD OF DIRECTORS**

RANIPUR ENERGY (PVT) LIMITED

Head Office

C-98, Kehkashan Scheme No.5


Block No. 2, Clifton, Karachi

Tel: +92-21-35291731-37

**EXTRACT OF RESOLUTION PASSED BY THE BOARD OF DIRECTORS OF M/S
RANIPUR ENERGY (PVT) LIMITED, IN ITS MEETING HELD ON MAY 23, 2017 AT
11.00 A.M AT ITS REGISTERED OFFICE AT C-98, KEHKASHAN SCHEME NO.5,
BLOCK NO.2, CLIFTON, KARACHI**

RESOLVED That;

Mr. Liaquat Ali , Director of M/s Ranipur Energy (Pvt) Limited (REL) shall be authorized on behalf of M/s REL to sign and submit application to National Electric Power Regulatory Authority (NEPRA) for grant of Generation License for 60 MW (Gross) Co-generation Power Plant by Ranipur Energy (Pvt) Limited, located at M/s Ranipur Sugar Mills Limited, Taluka Kot Digi, District Khairpur. He shall also be authorized to sign all required agreements/applications/documents which may be required by NEPRA for grant of Generation License.


CHIEF EXECUTIVE
RANIPUR ENERGY (PVT) LIMITED
C 98 Kehkashan Scheme No.5
Block No.2 Clifton, Karachi

Dated : 23.05.2017



A029298



SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

COMPANY REGISTRATION OFFICE, KARACHI

CERTIFICATE OF INCORPORATION

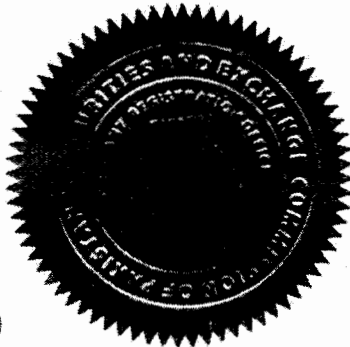
[Under section 32 of the Companies Ordinance, 1984 (XLVII of 1984)]


Corporate Universal Identification No. 0108698

I hereby certify that RANIPUR ENERGY (PRIVATE) LIMITED is this day incorporated under the Companies Ordinance, 1984 (XLVII of 1984) and that the company is limited by shares.

Given under my hand at Karachi this Twenty Second day of May, Two Thousand and Seventeen.

Incorporation fee Rs. 420500.0/= only




(Kashif Mahmood)
Deputy Registrar of Companies

THE COMPANIES ORDINANCE, 1984

COMPANY LIMITED BY SHARES

MEMORANDUM OF ASSOCIATION

“RANIPUR ENERGY (PRIVATE) LIMITED”

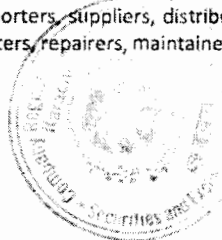


The Companies Ordinance, 1984

(Private Company Limited by Shares)

**MEMORANDUM OF ASSOCIATION
OF
RANIPUR ENERGY (PRIVATE) LIMITED**

- I. The name of company is **RANIPUR ENERGY (PRIVATE) LIMITED**.
- II. The Registered Office of the Company will be situated in the Province of Sindh.
- III. The objects for which the company is established are :
 1. To carry on, in Pakistan or elsewhere, all or any of the businesses of generating, supplying, converting, transforming, distributing, purchasing, importing, exporting and dealing in electricity and all other forms of energy and products or services associated therewith and to perform all other acts which are necessary or incidental to the business of electricity generation, supply, transmission and distribution of such form of energy and in such manner as may be deemed feasible and to sell and deliver the electricity thus generated, subject to requisite approvals from concerned authorities in Pakistan or abroad.
 2. Except for the businesses mentioned in sub-clause III (4) hereunder, the company shall engage in all the lawful businesses including but not limited to those specified below and shall be authorized to take all necessary steps and actions in connection therewith and ancillary thereto including those specified in sub-clause III (3):
 - (a) To establish, erect, setup, construct, equip, operate, use, manage, maintain and run electric power generating projects and transmission systems for generating power by using wind, fuel, nuclear, thermal, geothermal power stations, solar, hydro, coal, steam, indigenous bagasse and/or any other alternative, renewable energy sources and bio-energy to generate electricity and in this regard establish power grid stations, switching, conversion and transmission facilities, grid stations, cables, overhead lines, sub-stations, switching stations, tunnels, cable bridges, link boxes, heat pumps, plant and equipment, transmission towers, buildings, workshops and other facilities as may from time to time be necessary for attainment of objects of the company.
 - (b) To carry on all or any of the businesses of wholesalers, retailers, traders, importers, exporters, suppliers, distributors, designers, developers, manufacturer, installer, filters, testers, repairers, maintainers, contractors, constructors, operators, users, inspectors, re-



conditioners, improvers, alterers, protectors, removers, hirers, replacers, importers and exporters of and dealers in electrical appliances, systems, products and services used for energy conservation and generation, equipments, machinery, materials and installations, including but not limited to cables, wires, meters, tracks, rails, pipelines and any other plan, apparatus equipment, systems and things incidental to the efficient generation, procurement, transformation, supply and distribution of electricity.

- (c) To setup, operate and manage one or more power plants in order to generate, sell and supply electricity to industrial and other consumers, through distribution networks established, owned and operated by the company itself or by any other person, corporate body, autonomous or semiautonomous corporation or authority or local body, and for that purpose to acquire land, whether freehold or leasehold, machinery and equipment, and construct, install, operate and maintain thereon power houses, civil and mechanical works and structures, grid stations, transmission tower, power lines, buildings workshops and other facilities as may from time to time be necessary for the attainment of the objects of the company.
- (d) To carry on the business of electrical engineers, electricians, engineers, consultants, agents, suppliers of services and manufacturers of electrical plant, machinery and generally to install, acquire, execute, provide, operate and maintain all necessary plant, machinery, equipment, cables, wires, accumulators, lamps, exchanges, telephones, and apparatus and to provide any services related or incidental thereto.
- (e) To act as electrical, mechanical, civil work contractors to local and foreign governments, agencies, authorities, municipalities, autonomous corporations, private and public companies in power sector.
- (f) To generate, produce and sell power to utility companies, power distribution networks and organizations in the power sector within or outside Pakistan
- (g) To engage in locally or internationally in all types and modes of transportation, logistics, shipping, freight forwarding, custom, clearance, material management, warehousing, storage, delivery distribution and marketing and all other related or ancillary activities as may be necessary in connection with the business of the Company and to provide such services to any other individuals, businesses or institutions including private or public and whether in Pakistan or outside Pakistan
- (h) To carry on the business of importers and exporters of all kinds of goods, articles and things either manufactured, semi-manufactured or raw materials, and to act as sales representatives either on commission or on profit sharing basis of all kinds of goods and materials, as permissible under the law
- (i) To improve the effectiveness, efficiency and sustainability of organizations and business through providing relevant solutions and services and to enter into arrangements with companies, firms and persons for such purposes on such terms and in such manner as may be deemed expedient by the company



- (j) To carry on business as consultants in relation to any activities related with the objects of the company for local and foreign individuals, firms, companies, business enterprises and organizations whether private, government or semi-government and to do all such act or deeds as are necessary or ancillary to these objects of the company
- (k) To use trademarks, trade name or brands, for the services of the company and adopt such means of making known the business and/or products and services of the company as may seem expedient and in particular by advertising on radio, television, internet, in newspapers, magazines, periodicals, by circulars, by purchase and exhibition of works of art and interest, by opening stalls and exhibitions, by publication of books and periodicals, by distribution of samples and grant, rewards and donations.
- (l) To conduct, sponsor or otherwise participate in training programs, courses, seminars and conferences in respect of any of the objects of the company and accordingly design, develop, import, export, buy, sell and market all sorts of study and training material related to the business of the company.
- (m) To establish, provide and maintain research and development centres/laboratories and centers for conduction scientific research for the development of products and services and establish, provide and maintain centers for training and educating its personnel and to hold and organize lectures, demonstrations, exhibitions, classes, meetings and conferences in connection therewith.
- (n) To carry on any other business which in the opinion of the Directors of the Company may seem capable of being conveniently carried out in connection with or as ancillary to any of the above businesses or to be calculated directly or indirectly to enhance the value of or render profitable any of the property of the Company or to further any of its objects

3. And for the purpose of achieving the above objects, the company is authorized:-

- (i) To acquire and secure membership, seats or privileges either in the name of the Company or its nominee or nominees in and of any association, trade and corporate bodies or other institutions in Pakistan or any part of the world for furtherance of the business of the Company.
- (ii) To pay commission or remunerate any company or firm or person (whether an officer of the company or not) for services rendered in connection with the business of the Company.

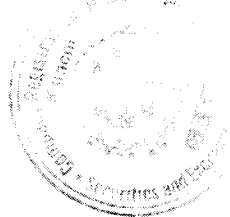


- (iii) To enter into any arrangement with any government or authorities (federal, provincial, municipal, local or otherwise), or any corporations, companies, undertakings or persons in Pakistan or elsewhere that may seem conducive to the company's object and to obtain from any such government, authority, corporation, Company, undertaking or person any charters, contracts, decrees, rights, privileges, licenses and concessions which the company may think desirable to obtain and to carry out, exercise and comply with any such arrangements, charters, contracts, decrees, rights, privileges, licenses and concessions.
- (iv) To employ, hire, appoint and terminate any staff or employee whether on a permanent or contractual basis, at any time at its own discretion, according to its business and operational needs, and practices to pursue the objects and purposes of the Company.
- (v) To get insured against losses, damages, risks, accidents and liabilities of all kinds which may affect the Company whether in respect of its contracts, agreements, consequential loss of profits, advances or securities or in respect of servants or employees of the Company, or in respect of properties belonging to or rented or hired by the Company, either by setting apart funds of the Company or by effecting such insurance, and in latter case, to pay premium thereon.
- (vi) To open accounts with bank or banks or financial institutions and to draw, make, accept, endorse, execute and issue promissory notes, bills of exchange, cheques, bills of lading, warrants, debentures and other negotiable or transferable instruments, concerning the business of this Company.
- (vii) To invest moneys of the Company not immediately required by the Company and subscribe for, take, acquire, hold shares, stocks, debentures, securities or instrument of redeemable capital of any other Company or corporation or body corporate, whatsoever, whether local or overseas, and to invest moneys of the Company in any other manner, but not to act as an investment Company.
- (viii) To erect maintain, alter, extend, purchase, take on lease, let out, plant and machinery, equipment and to erect, maintain, alter, extend and purchase and sell buildings on any land purchased, leased or otherwise acquired by or for the Company or for any of the purposes connected with the business or objects of the Company.
- (ix) To borrow, procure, raise money in local or any foreign currency from banks, financial institutions, non-banking financial institutions and or avail finance under any Islamic financing scheme like modaraba, morabaha, musharika, Ijara-wa-iktina and to borrow, procure, or to secure the money in such manner as the Company may deem fit and particularly by mortgage or hypothecation of its property in full or in part or both the present and future assets or by the issue of shares, stocks, bonds, debentures, participation term certificates, term finance certificate, or any other form of



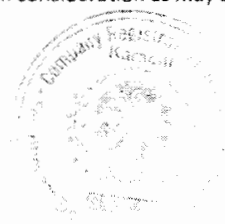
redeemable capital or securities charged or based upon the undertaking of the company, or any part of its property, both present and future and generally to borrow or procure money for the purposes of the business of the company in such manner as the Company shall deem fit, including by issue of debenture, bonds, securities, participation term certificates, term finance certificates, either permanent or redeemable or repayable or convertible into shares and to secure any securities of the company by a trust or other assurances.

- (x) To pay commission or otherwise remunerate any Company or firm or firms or person or persons (whether an officer of the Company or not) for services rendered in placing or assisting to place any of the shares of the Company or any debenture or other securities of the Company, or for negotiating any of the purchase or sale by the Company, or for rendering any service of any kind whatsoever to the Company.
- (xi) To lend and advance money or give credit to such persons or companies and on such terms as may seem expedient, and in particular to clients, and others having dealings with the Company and to guarantee the performance of any contract or obligation and the payment of money of or by any persons or companies and generally to give guarantees and indemnities.
- (xii) To procure the incorporation, registration or other recognition of the Company in any country, state or place and to establish and regulate and open branches of the Company in any part of the world for the purposes of the company's business.
- (xiii) To pay either in cash or by allotment of shares or otherwise as the company deems fit, all the costs, charges and expenses preliminary and incidental to the promotion, formation, establishment and registration of the Company.
- (xiv) To grant pensions, allowances, gratuities and bonuses to directors, officers, ex-officers, employees or ex-employees of the Company or its predecessors in business or the dependents or connections of such persons and establish and support or aid in the establishment and support of associations, institutions, funds, trusts and conveniences calculated to benefit employees and ex-employees and officers and ex-officers (including Directors and Ex-Directors) of the Company, or the dependents or connections of such persons, and to pay gratuities or grant pensions and allowances, and to make payments towards insurance, and to subscribe or guarantee money for charitable or benevolent objects, or for any exhibition, or for any public, general or useful object(s).
- (xv) To distribute any part of the undertaking, property and assets of the Company in event of winding up among its creditors and members in specie or in kind at the time of



dissolution of the company but so that not distribution amounting to a reduction of capital may be made without the sanction (if any) for the time being required by law.

- (xvi) To create provident fund, gratuity fund, pension fund, reserve fund, sinking fund, or any other special fund conducive to the interest of the Company.
- (xvii) To capitalize such portion of the profits accumulated profit or reserves of the Company as are not distributed amongst shareholders of the company in the form of dividend and as the Directors of the Company may think fit and to issue bonus shares as fully paid-up in favour of the shareholders of the Company.
- (xviii) To remunerate Directors, officials, employees of the Company or any other person or firm or Company rendering services to this Company, out of, or in proportion to the returns or profits of the Company or otherwise as the Company may think proper, either by cash payment and/or by the allotment to him or them shares or securities of the Company credited as paid up in full as may be though expedient in accordance with the laws to which the Company may be subject.
- (xix) To appoint agents (except managing agent), experts and attorneys to do any and all of the above matters and things on behalf of the company or anything or matter for which the company may act as agent (except managing agent) or in any other way whatsoever interested or concerned in any part of the world.
- (xx) To establish and maintain branches and offices in or outside Pakistan, and to enter into contracts or agency agreements (other than managing agency) with any other person, firm or company or for the distribution centers for the efficient carrying on of the business of the company.
- (xxi) To purchase or by any other means acquire and take options over any property whatsoever whether movable or immovable, and any rights or privileges of any kind over or in respect of any property convenient to the Company.
- (xxii) To sell and /or otherwise deal with or dispose of the undertaking and / or real and moveable and immovable property of the Company or any part thereof for such consideration as the Company deems appropriate.
- (xxiii) To sell, mortgage, charge, hypothecate, pledge, give on hire, rent or license or otherwise dispose of and conversely to accept mortgages, charges, hypothecations, pledges, leases, hires and purchases of and over all kinds of movable and immovable properties and assets, including lands, buildings, offices, machineries, vehicles, goods, privileges, licenses, patents and industrial properties for such consideration as may be



deemed feasible for the Company and to sign, execute, register and deliver appropriate documents, charge forms, deeds, contracts, etc.

- (xxiv) To pay for any property or rights acquired by the company either in cash or fully paid-up shares, or by any securities which the company has power to issue, or partly in one mode and partly in another, and generally on such terms as the company may determine.
- (xxv) To guarantee the payment of money unsecured or secured by or payable under or in respect of promissory notes, bonds, debentures, debenture-stocks, contracts, mortgages, charges, obligations, instruments and securities of the Company or of any other company and generally to guarantee or become sureties for the performance of any contracts or obligations to stand as surety for payment/repayment of finances, loans, advances and other indebtedness of third parties, including sister concerns and associations; to hypothecate, charge, and/or create liens or other encumbrances on the Company's movable and immovable properties in favour of financial institutions, banks creditors and other principals.
- (xxvi) To subscribe or contribute to any charitable, benevolent or useful objects of a social or public character, the support of which will, in the opinion of the company, tend to increase its reputation or popularity among its employees, its customers, or the public generally.
- (xxvii) To aid any association, body or movement having for its object the solution, settlement or surmounting of industrial or labor problems or troubles, or the promotion of industry or trade.
- (xxviii) To adopt such means (both in and outside Pakistan) of promotion, marketing and making known and advertising the products and services of the company as may seem expedient subject to the laws to which the company may be subject.
- (xxix) To transfer the registered office of the company from one place or province to another if deemed beneficial for the company subject to regulatory approval(s) as may be applicable under the laws of Pakistan.
- (xxx) To amalgamate, merge with, absorb, reconstruct, de-merge, acquire or take over any other company or the whole or part of any undertaking having objects altogether or in part similar to those of the company or carrying on any business capable of being conducted so as directly or indirectly to benefit this company, whether by sale or purchase of the assets, property or undertaking, or divestiture of the whole or part of the undertaking of the company or by partnership or any arrangement in the nature



of partnership or in any other manner or to enter into and carry into effect any arrangement, or for sharing of profits, with any partnership, undertaking or person carrying on business within the objects of this company.

(xxxi) To apply, for purchase or otherwise acquire any patents, patent rights, copyrights, trademarks, licenses, concessions and the like, conferring any exclusive, non-exclusive or limited right to use, or any secret or other information to any invention which may seem capable of being used for any of the purposes of the company, or the acquisition of which may seem calculated directly or indirectly to benefit the company and to use, exercise, develop, or grant licenses in respect of, or otherwise turn to account the property, rights of information so acquired;

(xxxii) To carry on any business or activity and any act or thing which, in the opinion of the company, is or may be capable of being conveniently carried on or done in connection with any of the above objects, or likely directly or indirectly to enhance the value of or render more profitable all or any part of the company's property or assets or otherwise to advance the interest of the company or its members.

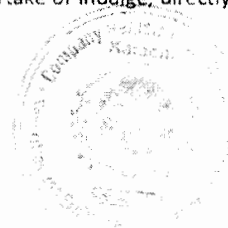
(xxxiii) To cease carrying on and wind up any business or activity of the company, and to cancel any registration of and to wind up and procure the dissolution of the company subject to the provisions of the law for the time being in force.

(xxxiv) To exercise all or any of the above objects and to do all such other things as are incidental or conducive to the attainment of the above objects or any of them.

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

(xxxvi) It is expressly declared that the several sub-clauses of this clause and all the powers expressed therein are to be cumulative but in no case unless the context expressly so requires is the generality of any one sub-clause to be narrowed or restricted by the name of the Company or by the particularity of expression in the same sub clause or by the application or any rule of construction such as the ejusdem generics rule, and accordingly none of such sub-clauses or the objects therein specified or the power thereby conferred shall be deemed subsidiary or auxiliary, merely to the objects mentioned in any other sub-clause of this clause and the Company shall have full power to exercise all or any of the powers conferred by any provisions of this clause in any part of the world.

4. Notwithstanding anything contained in the foregoing clause III (2) nothing contained herein shall be construed as empowering the Company to undertake or indulge, directly



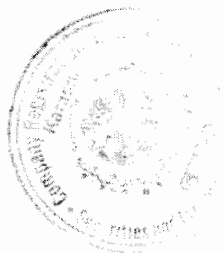
or indirectly in the business of a Banking Company, Non-banking Finance Company (Mutual Fund, Leasing, Investment Company, Investment Advisor, Real Estate Investment Trust management company, Housing Finance Company, Venture Capital Company, Discounting Services, Microfinance or Microcredit business), 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.

5. It is hereby undertaken that the company shall not:

- a. engage in any of the business mentioned in Clause (III) (4) above or any unlawful operation;
- 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.

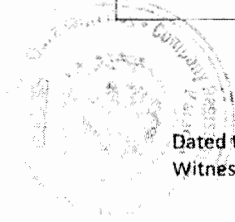
IV. The liability of the members is limited.

V. The Authorized Capital of the Company is Rs.100,000,000/- (Rupees One Hundred Million Only) divided into 10,000,000 (Ten Million) Ordinary shares of Rs.10/- (Rupees Ten) each with powers to increase and reduce the capital of the Company and to divide or consolidate the shares in the Capital for the time being into several classes in accordance with the provisions of the Companies Ordinance, 1984.



We, the several persons, whose names and address are subscribed below, are desirous of being formed into a company in pursuance of the **Memorandum of Association** and we respectively agree to take the number of shares in the capital of the company set opposite our respective names.

1	2	3	4	5	6	7	8
NAME AND SURNAME (PRESENT AND FORMER) IN FULL (IN BLOCK LETTERS)	FATHER'S/ HUSBAND'S NAME IN FULL	CNIC/PASSPORT/ REGISTRATION NUMBER	NATIONALITY WITH ANY OTHER FORMER NATIONALITY	OCCUPATION	RESIDENTIAL ADDRESS IN FULL	NUMBER OF SHARES TAKEN BY EACH SUBSCRIBER	SIGNATURE
1. SULTANA SIDDIQUI	QAZI IMDAD ALI	42301-0758819-2	PAKISTANI	BUSINESS	B-72, NAVEEL HOUSING SOCIETY, ZAMZAMA, CLIFTON, KARACHI	10,000 (TEN THOUSAND)	
2. SHUNAID QURESHI	SHAFI MUHAMMAD QURESHI	42301-8863533-9	PAKISTANI	BUSINESS	B-72, NAVEEL HOUSING SOCIETY, ZAMZAMA, CLIFTON, KARACHI	80,000 (EIGHTY THOUSAND)	
3. LIAQUAT ALI	SIFTUDDIN	33100-3432015-3	PAKISTANI	PROFESSIONAL	HOUSE # 916-C, CANAL VIEW HOUSING SOCIETY, MULTAN ROAD LAHORE	10,000 (TEN THOUSAND)	
						100,000 (ONE HUNDRED THOUSAND)	



Dated the 18th day of May 2017

Witness to above signature: Securities & Exchange Commission of Pakistan

FREE OF COST COPY

Certified to be True Copy
 Deputy Registrar of Companies
 Date: 22/05/2017

THE COMPANIES ORDINANCE, 1984

COMPANY LIMITED BY SHARES

ARTICLES OF ASSOCIATION

“RANIPUR ENERGY (PRIVATE) LIMITED”



The Companies Ordinance, 1984
(Private Company Limited by Shares)

ARTICLES OF ASSOCIATION
OF
RANIPUR ENERGY (PRIVATE) LIMITED

INTERPRETATION

1. Except as herein specifically otherwise provided, Table 'A' of the First Schedule to the Ordinance shall apply to the Company. **Table 'A' shall Apply**
2. In these Articles the words and expressions below shall bear the meanings set opposite to them unless there be something in the subject or context inconsistent therewith. **'Interpretations'**

"The Articles" means these Articles of Association as originally framed or as from time to time altered by special resolution. **'The Articles'**

"The Board" means the board of Directors of the company for the time being. **'The Board'**

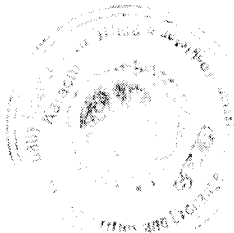
"The Company" means **RANIPUR ENERGY (PRIVATE) LIMITED.** **'The Company'**

"The Chief Executive" means the Chief Executive of the Company, by whatever name called appointed pursuant to Section 198 of the Ordinance. **'The Chief Executive'**

"The Chairman" means the Chairman of the Board of the company appointed from time to time pursuant to these Articles. **'The Chairman'**

"The Directors" mean the Directors for the time being of the company including Alternate Directors for the time being of the company. **'The Directors'**

"Dividend" includes bonus shares. **'Dividend'**



"Electronic" and **"Electronically"** includes electrical, digital, magnetic, optical, bio-metric, electro-chemical, wireless, electromagnetic technology or by any other means of information technology.

**'Electronic' and
'Electronically'**

"Financial Statements" means a balance sheet, income and expenditure account and cash flow statement of the company.

**'Financial
Statements'**

"In writing" and **"Written"** include printing, lithography, type-writing and where permitted or specified by the Board, also includes Electronic transmission, including but not limited to facsimiles, telex, downloading through computers, electronic mail, other modes of representing or reproducing words in a visible form and any usual substitutes.

**'In Writing' and
'Written'**

"Member" means member of the company in accordance with the provisions of section 2(1) (21) of the ordinance.

'Member'

"Month" means calendar month.

'Month'

"The Ordinance" means the Companies Ordinance, 1984 or any statutory modification or re-enactment thereof for the time being in force.

'The Ordinance'

"The Office" means the Registered Office for the time being of the company.

'The Office'

"Proxy" includes an attorney duly constituted under a power of attorney.

'Proxy'

"Person" includes the Government of Pakistan, the Government of the Provinces, Corporations, Associations, Bodies Corporate as well as individuals.

'Person'

"The Registrar" means a Registrar, an Additional Registrar, a Joint Registrar, a Deputy Registrar or an Assistant Registrar of Companies.

'The Registrar'

"The Register" means the Register of Members to be kept pursuant to section 147 of the Ordinance.

'The Register'

"Special Resolution" has the same meaning as is assigned by section 2(1)(36) of the Ordinance.

**'Special
Resolution'**

"The Secretary" means the Secretary for the time being of the Company.

'The Secretary'

"The Seal" means the common seal of the company.

'Seal'



Words importing the masculine gender shall include the feminine 'Gender' gender.

Unless the context otherwise requires, words or expressions contained in these Articles shall bear the same meaning as in the Ordinance.

PRIVATE COMPANY

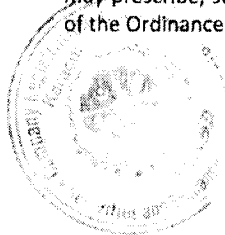
3. The company is a private company and accordingly. **Company to be Private Company**
- a) The right to transfer shares of the company is restricted in the manner hereinafter provided.
- b) The number of members for the time being of the company (not including persons who are for the time being in the employment of the company) shall be limited to fifty (50) provided that, for the purpose of this provision, where two or more persons hold one or more shares in the company jointly, they shall be treated as a single member; and
- c) An invitation to the public to subscribe for any shares or stock or debentures or debenture stock of the company is hereby prohibited.

BUSINESS

4. The business of the company shall include all or any of the objects enumerated in the Memorandum of Association and can be commenced immediately after the incorporation of the company as the Directors may think fit, notwithstanding that only part of the capital has been subscribed. **Business of the Company**

CAPITAL

5. The Authorized Capital of the Company is Rs.100,000,000/- (Rupees One Hundred Million Only) divided into 10,000,000 (Ten Million) Ordinary Shares of Rs.10/- (Rupees Ten) each. **Authorized Capital**
6. The Company may, in general meeting vide special resolution, increase the authorized share capital by such sum as the resolution may prescribe, subject, nevertheless, to the provisions of section 92 of the Ordinance. **Increase of authorized capital**



- | | | |
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| 7. | The Directors shall, as regards any allotment of shares, duly comply with such of the provisions of sections 68 to 73, as may be applicable thereto. | Return as to Allotments |
| 8. | The new shares consistent with the provisions of the Ordinance shall be issued upon such terms and conditions and with such rights and privileges annexed thereto, as the resolution passed in a general meeting, creating the same, shall direct and if no direction be given, as the Directors shall determine. | How far new shares to rank with shares of original capital |
| 9. | The Company may increase its capital by the issue of further shares and may decide to whom such shares shall be offered and in the absence of such determination, the shares shall be under the control of the Directors who may allot or otherwise dispose off the same to such persons, on such terms and conditions and at such times, as the Directors, subject to the provisions of section 86 of the Ordinance, may deem fit and subject to section 73(1)(b) to give any person for such consideration as the Directors deem fit, in payment or part payment for any property sold or transferred, goods or machinery supplied or for services rendered to the company in or about the formation or promotion of the company or the conduct of its business or in satisfaction of any outstanding debt or obligation of the company, and with power to issue shares either at par or at a premium and, subject to the provisions of the Ordinance, at a discount, provided always that upon the issue of further shares, the Directors shall offer such shares to the members in proportion to the existing shares held by each member and such offer shall be made by notice specifying the number of shares to which a member is entitled and limiting a time within which the offer may be accepted or renounced in favour of any other member of the company or one or more of such persons as are mentioned in Article 26(a) of these Articles, otherwise the offer shall be deemed to have been declined and after the expiration of such time or on receipt of information from the member to whom such notice is given that he declines to accept or renounce the same, the Directors may dispose off such shares in such manner and on such terms as may be consistent with the provisions of the Ordinance. The new shares shall be subject to the same provisions with regard to transfer, transmission and otherwise as the shares in the existing share capital. | Further issue of Capital |
| 10. | A Resolution by which any share is sub-divided or consolidated may subject to provisions of the Ordinance determine that as between holders of shares resulting from sub-division or consolidation, rights of profits, votes and other benefit attaching to them will be proportionate to their paid up values and where shares issued or sub-divided or consolidated are of the same class as those previously | Sub-division or consolidation of shares |

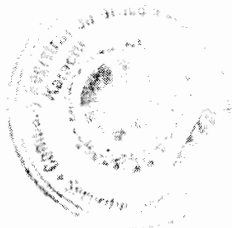


issued, the rights attaching to them, subject as aforesaid, shall be the same as those attaching to the shares previously held.

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| 11. | Subject to the provisions of the Ordinance, the company may from time to time by special resolution reduce its share capital in any way and in particular (without prejudice to the generality of the power) by paying off capital or canceling capital which has been lost or is unrepresented by available assets or reducing liability on the shares or otherwise as may seem expedient and paid-up capital may be cancelled as aforesaid without reducing the nominal amount of the shares by the like amount. | Reduction of capital and how carried into effect |
| 12. | Except to the extent permitted by the Ordinance, no part of the funds of the company shall be employed in the purchase of any shares of the company, and the company shall also not give, whether directly or indirectly, and whether by means of a loan, guarantee, the provision of security or otherwise, any financial assistance for the purchase of or in connection with a purchase made or to be made by any person of any shares of the company or give any loan upon the security of any shares of the company. | Loans, advances for and purchase of company's shares prohibited |

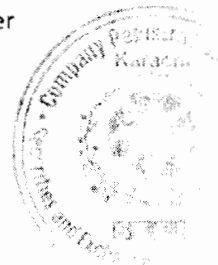
SHARES

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| 13. | Shares may be registered in the name of any individual, limited company or other body corporate but not in the name of minor or a firm. Not more than four persons shall be registered as joint-holders of any shares. | Persons in whose name shares to be registered |
| 14. | If any share stands in the name of two or more persons, the person first named in the Register shall, as regards receipt of dividend or bonus or service of notice, and all or any other matters connected with the company except the transfer of shares, be deemed the shareholder. | The first named of joint holders of shares |
| 15. | In the case of the death of any one or more of the persons named in the Register as the joint-holders of any share, the survivor or survivors shall be only person or persons recognized by the company as having any title to or interest in such share, but nothing herein contained shall be taken to release the estate of a joint-holder from any liability on shares held by him jointly with any other person. | Death of one or more of joint holders of shares |
| 16. | Every shareholder shall provide to the company an address and such address shall for all purposes be deemed to be his registered address. | Shareholders to give address |



CERTIFICATE

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| 17. | Every person whose name is entered as member in the register shall without payment be entitled to receive, after allotment or registration of transfer, one certificate for all his shares or several certificates each for one or more of his shares and upon payment of such charges, if any, as the Directors may determine for every certificate after the first. | Member's right to certificate |
| 18. | The certificate of title of shares and duplicates thereof when necessary shall be issued under the seal of the company and signed by two Directors, or by one Director and the Secretary. | Certificates |
| 19. | The company shall not be bound to issue more than one share certificate in respect of a share or shares held jointly by two or more persons, and delivery of a share certificate to any one of joint-holders shall be sufficient delivery to all. | Delivery of certificate |
| 20. | The company shall, within ninety days, after the allotment of any of its shares, and within forty five days after the date on which the application for the registration of a transfer has been lodged, complete and have ready for delivery the certificates of all shares, allotted or transferred, and shall serve notice to the shareholder, unless the conditions of issue of the shares otherwise provide. | Time of Delivery of Certificate |
| 21. | If any certificate be worn out, defaced, destroyed or lost or if there is no further space on the back thereof for endorsement of transfers, it may be replaced, provided, however, that such new certificate shall not be granted except upon delivery of the worn out or defaced or used up certificate for the purpose of cancellation or upon proof of destruction or loss to the satisfaction of the Directors and on such indemnity as the Directors may deem adequate in case of certificate having been lost or destroyed. Any replaced certificates shall be marked as such. | Replacement of certificate |
| 22. | Members shall not become entitled to fractional shares in case of issue of new shares or any consolidation or sub-division of shares. The directors, however, may decide to cumulate the fractions and sell the shares so resulting, at a reasonable price and distribute amongst the members who had otherwise been entitled to such fractional shares in due proportion of the net sale proceeds. | Proceeds from Fractional shares |
| 23. | For the purpose of giving effect to any sale under Article 22 the Directors may authorize any person to transfer the shares sold to the purchaser thereof, and the purchaser shall be registered as the holder | Sale of whole shares in lieu of |



of the shares comprised in any such transfer, and he shall not be entitled to see the application of the purchase money nor shall his title to the shares be affected by any irregularity or invalidity in the proceedings in reference to the sale. **fractional amount**

COMMISSION AND BROKERAGE

24. The Company may, subject to the Ordinance, at any time, pay commission or brokerage to any person for subscribing or agreeing to subscribe (whether absolutely or conditionally) for any shares or securities of the company, or procuring or agreeing to procure such subscriptions (whether absolute or conditional). **Commission and brokerage**
25. The company may issue ordinary shares or grant option to convert into ordinary shares against loans, indebtedness, debenture and/or redeemable capital or other security in the manner provided in section 87 of the Ordinance. **Shares in lieu of debentures etc.**

TRANSFER AND TRANSMISSION OF SHARES

- 26 a) No transfer of share will be made by a member except to his spouse, parents, siblings and any or all his children and by a shareholder company to its employees and nominees, to the extent of qualification shares only, and to its subsidiary, holding or associated companies. **No sale or transfer of shares**
- b) In addition to transfer of shares sought to be made under Article 26(a) above, a share may at any time be transferred by a member or other person entitled to transfer, provided it is approved by the board. However, the directors may at their absolute and uncontrolled discretion decline to register such a transfer of shares but shall be bound to give a reason for such refusal.
- c) Any member desirous to sell or transfer any of his shares in the company shall give a notice in writing to the company (hereinafter called the transfer notice) notifying the company of the number of shares to be sold or transferred and the offer price per share except the transfer of qualification shares which are required to be held by the directors; or the shares, which are required to be transferred by operation of law.
- d) If in the opinion of the directors, the price of the shares so offered is materially higher than their fair value, they shall, within seven days from the date of receipt of the aforementioned notice from the seller,

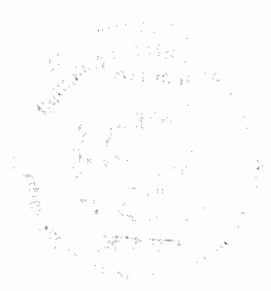
ask the seller to revise the price of such shares within seven days thereof, failing which the offer shall be deemed to be withdrawn.

- e) If the seller disagrees to revise the share price, the directors shall, at the cost of the company, proceed towards determination of fair value of the said shares from a firm of Chartered Accountants within the meaning of the Chartered Accountants Ordinance, 196 (X of 1961), not being the auditors of the company, having satisfactory Quality Control Review (QCR) rating by the Institute of Chartered Accountants of Pakistan, who shall submit share valuation report to the company and the Company shall forthwith send a copy of the same to the seller:

Provided that if the fair value so determined is not acceptable to the seller, he shall communicate the same to the Company within seven days from the date of receipt of the share valuation report, failing which the offer made by the seller shall be deemed to be withdrawn.

Explanation: The expression 'fair value' shall have the same meaning as defined in International Accounting and Financial Reporting Standards applicable in Pakistan.

- f) The directors shall, at the offered price or at such fair value as determined under Article 26(e), as the case may be, offer such shares to the existing members in proportion, as nearly as the circumstances admit, to the existing shares held by them
- g) The offer for sale of shares to the existing members shall be made by the company through a notice in writing specifying the number of shares each member is entitled to, the price per share and time period, being not less than seven days and not more than fifteen days from the date of receipt of the notice.
- h) The notice to the existing members under this rule shall be delivered in the manner provided under the Ordinance and the Rules:



Provided that where the notice is dispatched through registered post or courier service, the envelope containing the notice shall be marked as "Offer for sale of share".

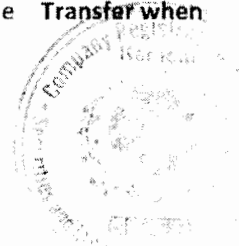
- i) If the offer for sale of shares by the company is not accepted by any member, it shall be the responsibility of such member to send a letter of decline containing his signature and thumb impression, to the company within the period provided in the offer letter.
- j) If no letter of decline is received by the company within the time provided in the offer letter, the company shall send a reminder letter allowing further time not being less than seven days advising such member to provide the said decline, failing which the offer will be deemed to be declined.
- k) The company shall maintain the record of all the communications, regarding offer for shares, made with the members.
- l) The acceptance to the offer for shares shall only be made through banking channel including but not limited to pay order or bank draft.
- m) If the whole or any part of the shares so offered are not accepted and paid for, the company may offer them to such other persons as the directors may deem fit:

Provided that where the whole or any part of the offered shares are transferred to such other person, the minutes of directors' meeting approving the said transfer, shall contain a statement to the effect that such shares were first offered to the existing members of the company through an offer letter but they declined the said offer or did not exercise their first right, as the case may be.

- n) If the whole or any part of the shares offered are not accepted and paid for by the members, and the directors also failed to transfer shares to such other person under Article 26(m), within sixty days from the date of receipt of original offer notice or revised offer notice, as the case may be, as mentioned under Article 26(c) and Article 26(d), the seller may transfer such number of shares not accepted and paid for to any other person as he may desire.



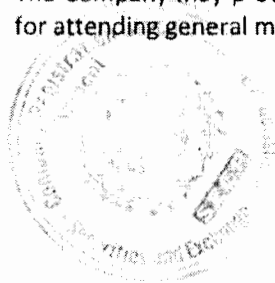
- i) Subject to the provisions of the Ordinance and these Articles directors shall not refuse to transfer any fully paid shares.
27. Subject to the provisions of the Ordinance and Article 26 hereof, no transfer of shares shall be registered unless a proper instrument duly stamped and executed by the transferor and the transferee has been delivered to the company together with the certificate or certificates of the shares. The instrument of transfer of any shares shall be in the common form and shall be signed both by the transferor and transferee and shall contain the part and address of the transferor and transferee. The transferor shall be deemed to remain the holder of such share until the name of the transferee is entered in the Register in respect thereof. Each signature to such transfer shall be duly attested by the signature of one witness who shall add his address and occupation. **Restriction on transfer**
28. Application for the registration of transfer of shares may be made either by the transferor or the transferee and subject to the provisions of Article 27 hereof, the company shall enter into the register of members, the name of the transferee in the same manner and subject to the same condition as if application for registration was made by transferee. **Application for registration of transfer**
29. If the Directors refuse to register the transfer of any shares they shall within 30 days from the date on which the transfer was lodged with the company send to the transferee and the transferor notice of such refusal. **Notice of refusal to register**
30. Upon the re-lodgment of instruments of transfer duly rectified from defect or the invalidity, the company shall within 45 days thereof, register such transfer in favour of the transferee, if satisfied as to the validity of the transfer in all material respects. **Time limit for registering transfer**
31. Every transmission of share shall, if so required by the directors, be evidenced by an instrument of transmission in such form and shall be verified in such manner as the Directors may require. The Directors may decline to register any such transmission unless it shall be in such form and so verified that the regulations of the company have been complied with. All instruments of transmission which shall be registered shall remain in the custody of the company for such period as the Directors may determine. Any instrument of transmission which the Directors may decline to register or act upon shall be returned to the person depositing the same. **Evidence of Transmission and powers to refuse registration of transmission**
32. Where it is proved to the satisfaction of the Directors that an instrument of transfer duly signed by the transferor and the **Registration of Transfer when**



- transferee has been lost, the company may, if the Directors shall think fit, by an application in writing made by the transferee and bearing the stamps required by an instrument of transfer, register the transfer on such terms as to indemnity as the Directors may think fit. **instrument or Transfer is lost**
33. No fee will be charged for registering transfer of shares. **Fee for transfer**
34. The transfer books and register of members may be closed for any time or times not exceeding in the whole forty-five days in each year, but not exceeding thirty days at a time, in accordance with manner specified in section 151 of the Ordinance. **Books and register may be closed**
35. The nominee, if any, appointed under section 80 of the Ordinance, or the executor or administrator of the estate or holder of succession certificate of the securities of a deceased member shall be the only person recognized by the company as having title to his shares. In case of joint-holders, the surviving holders or the executors or administrators of the estate of or holders of succession certificate of the security of the last surviving holder shall be the only person entitled to be so recognized. Provided nevertheless that it shall be lawful for the Directors in their absolute discretion to dispense with the production of probate or letters of administration or succession certificate upon such terms as to indemnity or otherwise as the Directors may deem fit. **Nomination and share of deceased members**
36. No person shall be recognized by the company as holding any share upon any trust and the company shall not be bound by or recognize any equitable, contingent, future or partial interest in any share, or any interest in any fractional part of a share or (except only as required by law or under an order of court) any other right in respect of any share, except the absolute right to the entirety thereof in the registered holder. **Company may not recognize equitable rights in shares**

GENERAL MEETINGS

37. A general meeting to be called annual general meeting shall be held, in accordance with the provisions of section 158 of the Ordinance, within eighteen months from the date of incorporation of the company and thereafter at least once in every calendar year within a period of four months following the close of its financial year and not more than fifteen months after the holding of its last preceding annual general meeting. A general meeting shall be held on a date, time and place as may be determined by the Directors. **Annual General meeting**
38. The Company may provide video conference facility to its members for attending general meeting at places other than the town in which **Attending Annual General Meeting**



general meeting is taking place after considering the geographical dispersal of its members:

**through Video
Conference
Facility**

Provided that if members, collectively holding 10% or more shareholding residing at a geographical location, provide their consent to participate in the meeting through video conference at least 10 days prior to date of meeting, the company shall arrange video conference facility in that city subject to availability of such facility in that city.

39. The Directors may, whenever they think fit, and shall on the requisition of the holders of not less than 10% of the issued capital of the company, forthwith proceed to convene an Extra-Ordinary General Meeting of the company and in case of such requisition, the provisions of section 159 of the Ordinance shall apply.

**When an extra
ordinary general
meeting to be
called**

NOTICE OF MEETING

40. Subject to the provisions of section 158 and 159 of the Ordinance twenty-one days' notice at 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) shall be given specifying the place, the day and the hour of meeting. In case of special business the general nature of that business shall be given in the manner hereinafter provided or in such other manner, if any, as may be prescribed by the company in general meeting or in the manner provided by the Ordinance, to such persons as are under the Ordinance or under these Articles, entitled to receive such notice from the company.

**Notice of
meeting**

41. An accidental omission to give notice of a meeting to or the non-receipt of notice of a meeting, by any person entitled to receive notice shall not invalidate the proceedings of the meeting.

**Omission to give
notice not to
invalidate
proceedings**

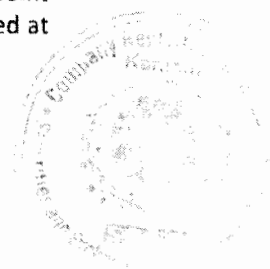
42. With the consent in writing of the members entitled to receive notice of an extra-ordinary general meeting, that meeting may be convened by such shorter notice and in such manner as the members may deem fit subject to approval of application of directors by the registrar of companies.

**Meeting by a
shorter notice**

PROCEEDINGS AT GENERAL MEETINGS

43. The business of a general meeting shall be to receive and consider the financial statements and the reports of the Directors' and of the Auditors, to elect Directors, to declare dividends and to appoint Auditors and fix their remuneration. All other business transacted at

**Business of the
Meeting**



an annual general meeting or at an extra ordinary general meeting shall be deemed special.

44. No business shall be transacted at any general meeting unless a quorum is present at the time when the meeting proceeds to business and throughout its proceedings. Two members present at the meeting, representing not less than 25% percent of the total voting power of the company, either of their own account or as proxies shall be a quorum. **Quorum**
45. If within half an hour from the time appointed for the meeting a quorum is not present, the meeting, if convened on 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 such adjourned meeting a quorum is not present within half an hour from the time appointed for holding the meeting, the members present shall be a quorum. **Quorum within half an hour**
46. The chairman, of the board of directors shall preside every general meeting of the company, or if he shall not be present within fifteen minutes after the time appointed for the holding of the meeting or is unwilling to act, the Directors present shall elect one of the members of the Board to be chairman of the meeting, or if no Directors be present or if none of the Directors present decline to take the chair, the members present shall choose one of their number to be chairman of the meeting. **Chairman to preside**
47. The Chairman may with the consent of any meeting at which quorum is present (and shall if so directed by the meeting), adjourn the meeting from time to time and from place to place, 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. **Adjournment by Chairman**
48. At a general meeting, a resolution put to the vote shall be decided on a show of hands, unless a poll (before or on the declaration of the show of hands) is demanded in accordance with the provisions of section 167 of the Ordinance, as follows. **Poll when demanded**
- a) By the Chairman of the meeting of his own motion; or
- b) By one member having the right to vote on the resolution and present in person or by proxy if not more than seven such members are personally present, and by two such members present in person or by proxy if more than seven such members are personally present;



- c) By any member or members present in person or by proxy and having not less than one-tenth of the total voting power in respect of resolution;

Unless a poll is so demanded, a declaration by the Chairman of the meeting 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 containing the minutes 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 such resolution.

49. If a poll is demanded on any matter other than the election of a Chairman or on a question of adjournment, it shall be taken in accordance with the manner laid down in section 168 of the Ordinance at such time, not more than fourteen days from the day on which it is demanded, as the Chairman of the meeting may direct. The results of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded. The demand for a poll may be withdrawn at any time by the person or persons who made the demand. **Poll**
50. The demand of a poll shall not prevent the continuance of the meeting for the transaction of any business other than the question on which the poll has been demanded. **Other business to continue**
52. The Chairman of the meeting shall be the sole judge of validity of every vote tendered at such meeting. The Chairman present at the time of taking of poll shall be the sole judge of the validity of every vote tendered at such poll. **Chairman's decision conclusive**

VOTES OF MEMBERS

52. On a poll every member present in person or by proxy shall have one vote in respect of each share held by him. On a show of hands every member present in person or by proxy shall have one vote. **Votes of members**
53. In the case of joint-holders the vote of the senior member present whether in person or by proxy shall be accepted to the exclusion of the votes of the other joint-holders, and for this purpose seniority shall be determined by the order in which their names stand in the register. **Right of senior members to vote**
54. 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 a show of hands or on a poll, by his committee or other legal **Vote in respect of shares of**



guardian and any such committee or guardian may, on a poll, vote by proxy. **members of unsound mind**

55. No objection shall be raised to the qualification of any vote except at the meeting or adjourned meeting at which the vote objected to is given or tendered, and every vote not disallowed at such meeting shall be valid for all purposes. Any such objection made in due time shall be referred to the Chairman of the meeting whose decision shall be final and conclusive. **Objection to qualification of votes to be raised at the meeting**

56. On a poll, votes may be given either personally or by proxy. **How votes to be given on a poll**

57. The instrument appointing a proxy shall be in writing under the hand of the appointer or of his attorney duly authorized in writing, or, if the appointer is a corporation, under its common seal or the hand of an officer or attorney so authorized. A proxy shall be a Member of the company. **Instrument of proxy how made**

58. 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 the power or authority shall be deposited at the office 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. **Time for depositing proxy at office**

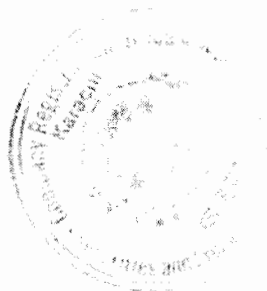
59. An instrument appointing a proxy may be in the following form, or in any other form which the Directors shall approve: **Form of proxy**

I,being a member of **RANIPUR ENERGY (PRIVATE) LIMITED** and holder of Ordinary shares as per Registered Folio No.....hereby appoint of as my/our proxy to vote for me/us and on my/our behalf at the annual or extra-ordinary (as the case may be) general meeting of the company to be held on the day of and at any adjournment thereof.
Signed by me this day of

Signature of Shareholder

Witness:

1. Signature _____
Name _____
Address _____
CNIC No/Passport No. _____



2. Signature _____
Name _____
Address _____
CNIC No/Passport No. _____

60. The instrument appointing a proxy shall be deemed to confer authority to demand or join in demand for a poll. **Effect of proxy**
61. 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 shares 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 place of the meeting before the commencement of the meeting or adjourned meeting at which the proxy is used. **When vote by proxy valid though authority revoked**
62. Any corporation or body corporate which is a member of the company may by resolution of its Directors or other governing body authorize such person as it thinks fit, to act as its representative at any meeting of the company or of any class of members of the company and the person authorized shall be entitled to exercise the same powers on behalf of the corporation which he represents as that corporation could exercise if it were an individual member of the company, present in person. A corporation attending a meeting through such representative shall be deemed to be present at the meeting in person. **Member corporation may appoint representative**

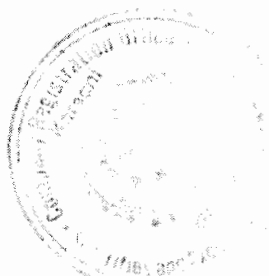
DIRECTORS

63. The number of Directors to be elected shall be fixed by the Directors, the number of Directors shall not be less than two. **Number of Directors**
64. The following shall be the first Directors of the Company. **First Directors**
1. Ms. Sultana Siddiqui
 2. Mr. Shunaid Qureshi
 3. Mr. Liaquat Ali

All the first Director(s) and directors appointed subsequent to incorporation, who shall be subject to retirement in terms of the provisions of the Ordinance, shall hold office until the election of Directors in the first annual general meeting; unless any of them earlier resigns, becomes disqualified as a Director or otherwise ceases to hold office.



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| 65. | Any person who seeks to contest an election to the office of Director shall, whether he is a retiring Director or otherwise, file with the company, not later than fourteen days before the date of the meeting at which elections are to be held, a notice of his intention to offer himself for election as a Director, provided that any such person may, at any time, before the holding of elections withdraw such notice. | Notice for election as a Director |
| 66. | The Directors shall be elected by the Members in general meeting from amongst the candidates eligible for election in the following manner: | Manner for electing directors |
| a) | Every member present in person or by proxy or by representative shall have such number of votes as is equal to the product of the number of voting shares held by him and the number of Directors to be elected; | |
| b) | The number of votes calculated in accordance with the preceding clause (a) may be given to a single candidate or may be divided between any two or more candidates in such manner as the person voting may choose; and | |
| c) | The candidate who gets the highest number of votes shall be declared elected as Director and then the candidate who gets the next highest number of votes shall be so declared and so on until the total number of Directors to be elected has been so elected. | |
| 67. | Save as provided in section 187 of the Ordinance, no person shall be appointed as a Director unless he is a member of the company. | Directors to be members |
| 68. | Retiring Directors shall continue to perform their functions until their successors are elected. | Retiring directors continue to perform functions |
| 69. | A Director elected by the members in general meeting shall hold office for a period of three years following the date from which his election is effective unless he earlier resigns, becomes disqualified for being a Director or otherwise ceases to hold office. | Term of office of director |
| 70. | The remuneration of a Director, if any, shall, from time to time to be determined by the Board and unless otherwise determined shall not exceed Rs. 5,000/- per meeting at which the Director shall be present. The Directors shall be paid such traveling, boarding, lodging and other expenses properly incurred by them in or about the performance of their duties or business, if any of them has to come to attend the Board or general meeting of the Company from outstation. | Remuneration of a director |



71. Any Director appointed to any executive office including, for the purpose of this Article, the office of Chief Executive, or to devote special attention to the business of the company or who otherwise performs extra services, which in the opinion of the Directors are outside the scope of the ordinary duties of the Directors, may be paid such extra remuneration by way of salary, fees, percentage or profits or otherwise as shall from time to time be determined by the Directors and be subject to provisions of these Articles and any law for the time being in force, applicable to the company. **Special Remuneration to directors for performing extra duties**
72. Subject to the provisions of section 181 of the Ordinance, the company may at any time, by resolution in general meeting, remove a Director, appointed under section 176 or section 180 or elected in the manner provided for in section 178 but no such resolution shall be deemed to have been passed if the number of votes cast against it is equal to or exceeds:
- i) The minimum number of votes that were cast for the election of a Director at the immediately preceding election of Directors, if the resolution relates to the removal of Director elected under sub-section (5) of section 178; or
 - ii) The total number of votes for the time being computed in the manner laid down in sub-section (5) of section 178 divided by the number of Directors for the time being, if the resolution relates to removal of Director appointed under section 176 or section 180.
73. A casual vacancy occurring among the elected directors may be filled up by the directors and in case of directors nominated under these Articles, by the person who nominated such directors respectively. A person appointed in lieu of an elected director shall hold office for the remainder of term of the director in whose place he is appointed. Before filling in any casual vacancy on the Board, the directors, shall in writing notify their intention of filling such vacancy to the member or members, if any, whose interest were represented by the director vacating office and shall fix a term of not less than fourteen clear days during which such member or members may recommend a candidate for appointment as Director to fill the vacancy. If the member or members concerned recommend a candidate in writing within the term prescribed, the directors may appoint him as director to fill the casual vacancy but upon such recommendation being made no person, other than the candidate recommended by such member or members may be appointed by the directors to fill the casual vacancy on the Board. **Casual vacancy to be filled by directors**



74. Any Director who is or intends to be absent for a period of not less than three (3) months from Pakistan, may, with the approval of the Board, nominate any person to be his alternate Director. Particulars of such nomination should be filed with the Secretary or Chief Executive of the company. Such alternate Director during the absence of the appointer from Pakistan, shall be entitled to receive notice of and to attend and vote at meeting of Directors and shall be subject to the provisions contained in these Articles. He may exercise and perform all such powers, directions and duties as his appointer could have exercised or performed. A Director may at any time by notice in writing to the company remove an alternate Director appointed by him. Upon his return to Pakistan or on the death of, or retirement or resignation as Director of the company, the alternate Director shall cease to be such provided that if any Director retires but is re-elected at the meeting at which such retirement took effect, an appointment made by him pursuant to this article which was in force immediately prior to his retirement and re-election shall continue to operate after his re-election as if he had not so retired. All appointments and removals of alternate directors shall be effected by writing under the hand of the Director making or revoking such appointment. For the purpose of assessing a quorum in accordance with the provisions of article 89 hereof, an alternate Director shall be deemed to be a director. An alternate Director may resign as such upon giving thirty (30) days prior notice in writing to the Directors to this effect unless a shorter notice period is allowed by the Board. An alternate Director need not be a member of the company.
75. The Directors may from time to time delegate any of their powers to a committee or committees of 2(two) or more members of their body or any other person as they think fit. Any committee so formed shall conform to any regulations that may be imposed upon it by the Directors.

**Alternate
Director**

**Executive
committee or
directors**

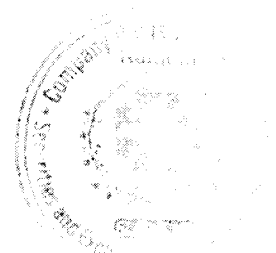
POWERS AND DUTIES OF DIRECTORS

76. The business of the company shall be managed by the Directors, who may pay all expenses incurred in setting up and registering the company. The Directors may exercise all such powers of the company as are not by the Ordinance or any statutory modification thereof for the time being in force, or by any other law or these articles, required to be exercised 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.

**General powers
of directors**



77. The Directors may, subject to any limitations or restrictions as the company in general meeting may deem fit to impose from time to time, exercise all the powers of the company to borrow money and to mortgage or charge its undertaking, property, or any part thereof, and to issue securities and debentures whether outright or as security for any debt, liability or obligations of the company or of any third party. **Borrowing powers of directors**
78. The Directors may from time to time and at any time by power of attorney appoint any company, firm or person or body of persons, whether nominated directly or indirectly by the Directors, to be the attorney or attorneys of the company for purpose and with such powers, authorities and discretion (not exceeding those vested in or exercisable by the Directors under these articles) for such period and subject to such conditions if any as they may think fit. **Power to appoint attorneys**
79. A Director of the company or a firm of which such Director is a partner or a private company in which such Director is a Director or member may with the consent of the company in general meeting hold any office of profit in the company. **Directors may hold office of profit**
80. Subject to the provisions of the Ordinance and in particular section 216 thereof, the Directors shall not be disqualified from contracting with the company either as vendor, purchaser, or otherwise, nor shall any such contract or agreement entered into by or on behalf of the company with any company or partnership or in which any director of the company shall be member or otherwise interested be avoided nor shall any such director so contracting or being such member or so interested, be liable to account to the Company for any profit realized by any such contract or arrangement by reason of such Director holding that office or of the fiduciary relation hereby established. However, the nature of his interest shall be disclosed by him at the meeting of the Directors at which the contract or arrangement is determined on, if the interest then exists, or in any other case at the first meeting of the Directors after the acquisition of the interest. A general notice that any director of the company is a director or a member of any other company or is a member of any named firm and is to be regarded as interested in any subsequent transaction with such company or firm shall as regards any such transaction be sufficient disclosure under this article. Any such general notice shall expire at the end of the financial year in which it is given. **Directors may make contract with the Company**
81. In accordance with provisions of section 219 of the Ordinance, a Register shall be kept by the Directors in which shall be entered particulars of all contracts or arrangement to which article 84 applies **Register of contracts with directors**

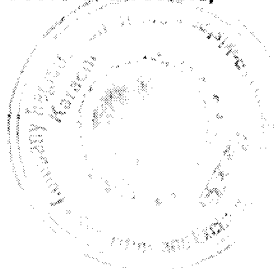


and which shall be open to inspection by any member at the office during business hours.

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| 82. | All cheques, promissory notes, drafts, bills of exchange and other negotiable instruments, and all receipts for moneys paid to the company, shall be signed, drawn, accepted, endorsed or otherwise executed, as the case may be, in such manner as the Directors shall from time to time determine. | Manner of signing certain documents |
| 83. | The Directors shall duly comply with the provisions of the Ordinance and in particular with the provision in regard to the registration of the particulars of mortgages and charges affecting the property of the company or created by it. | Directors to comply with the law |
| 84. | The Director shall keep a Register of Directors and Principal Officers and send to the Registrar all returns and statements required under the Ordinance. | Register of Directors, etc. |
| 85. | The company shall cause minutes to be made in books provided for the purpose. Such minutes shall have | Company to cause minute books to be maintained |
| a) | Names of the Directors present at each meeting of the Director and of any committee of the Directors. | |
| b) | Details of resolutions and proceedings of all meetings of the company, and of the directors and of committee of directors; and every director present at any meeting of directors or committee of directors shall sign his name in a book to be kept for the purpose and any such minutes of such a meeting if purporting to be signed by the Chairman thereof, or by the Chairman of the next succeeding meeting of the same body, shall be sufficient evidence without any further proof of the fact therein stated. | |

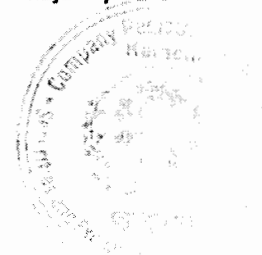
DISQUALIFICATION OF DIRECTORS

- | | | |
|-----|---|---------------------------------------|
| 86. | The office of Director shall be vacated if: | Vacation of office of director |
| a) | He becomes ineligible on any one or more grounds enumerated in section 187 of the Ordinance; | |
| b) | He absents himself from three consecutive meetings of the Directors or from all meetings of the Directors for a continuous period of three months, whichever is the longer, without leave of absence from the Board of Directors; | |



- ## PROCEEDINGS OF DIRECTORS

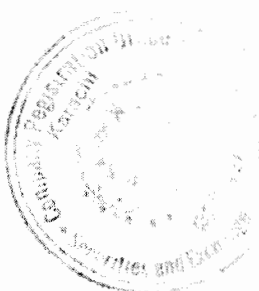
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|-----|--|--|
| 91. | The continuing Directors may act notwithstanding any vacancy in their body, but if and so long as their number is reduced below the quorum required under these Articles, the continuing Directors may act only for the purpose of filling vacancies in their body or summoning a general meeting of the company, as the case may be. | Procedure of continuing directors when there are vacancies to be filled |
| 92. | All acts done at any meeting of the directors or of 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. | Acts of directors to be valid if defect discovered afterward |
| 93. | Subject to the provision of Section 196(2) and Article 89, a resolution consented to in writing or by e-mail, telex or facsimile signed by all directors or their alternatives, shall be as valid and effectual as if it has been passed at a meeting of the Directors duly called and constituted. The consent may be in the form of counterparts. | Resolution by circulation |
| 94. | If at any meeting the Chairman is absent, or is unwilling to act, the directors may elect one of their members to act as the Chairman of the meeting. | Election of chairman for the meeting |

CHAIRMAN

- | | | |
|-----|--|-----------------------------------|
| 95. | The directors may elect from amongst themselves a Chairman of the Board. In the event the position of the Chairman falls vacant or he is held by the Board as not being able to carry out the duties of his office satisfactorily, the Board shall revoke his appointment and appoint another Director to be the Chairman of the board. The chairman of the meeting shall be the sole judge of the validity of every vote tendered at such meetings. | Company to have Chairman |
| 96. | The period for which the Chairman shall be appointed shall not exceed three years, unless he ceases to hold office or he earlier resigns. On the expiry of term of office, the Chairman shall be eligible for re-appointment in the manner provided in these articles or in accordance with the provisions of the Ordinance. | Tenure of Chairman |
| 97. | In the event of resignation of Chairman, before the expiry of his tenure, the directors shall appoint any other member of the board as Chairman to fill in the casual vacancy, for a term deemed appropriate, not exceeding the remaining term of the Board. | Casual Vacancy of Chairman |



CHIEF EXECUTIVE

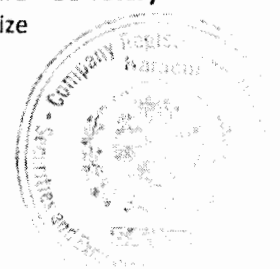
98. The directors shall within 15 days of the incorporation of the company or 14 days from the date of election of directors or the office of the chief executive failing vacant, as the case may be, appoint, subject to the provisions of section 198 of the Ordinance, a chief executive of the company. **Company to have chief executive**
- 99a) The period for which the Chief Executive shall be appointed shall not exceed three years unless he ceases to hold office or he earlier resigns or his services as Chief Executive has been terminated by the Board in accordance with the provisions of the Ordinance. On the expiry of term of office, the Chief Executive shall be eligible for re-appointment in the manner provided in these articles or in accordance with the provisions of the Ordinance. The terms and conditions of appointment of the Chief Executive, including his powers, duties, obligations and remuneration, shall be determined by the Directors, subject to the provisions of the Ordinance and these articles. **Tenure of Chief Executive**
- b) The Chief Executive shall exercise such powers, duties, obligations and privileges as the Directors may confer upon him from time to time and shall accordingly in exercise of such powers delegated to him, conform to any limits and restrictions which may be imposed by the Directors from time to time in this respect. **Terms, conditions power & duties of chief executive**
100. The Chief Executive shall be entitled to remuneration and benefits determined by the Directors. **Emoluments of the Chief Executive**
101. The Chief Executive may be removed in accordance with the provisions of section 202 of the ordinance. **Removal of chief executive**

CHIEF FINANCIAL OFFICER

102. A Chief Financial Officer (CFO) may be appointed by the Directors for such term, upon such remuneration and upon such conditions as they may think fit, and any CFO so appointed may be removed by them. Where there is no CFO capable of acting, the Directors may authorize an Assistant or Deputy CFO or any other officer of the company to perform the duties of CFO. **Company may appoint Chief Financial Officer**

SECRETARY

103. A Secretary may be appointed by the Directors for such term, upon such remuneration and upon such conditions as they may think fit, and any secretary so appointed may be removed by them. Where there is no secretary capable of acting, the Directors may authorize **Company may appointment Secretary**



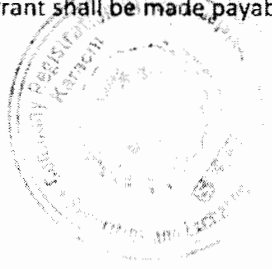
an Assistant or Deputy Secretary or any other officer of the company to perform the duties of secretary.

THE SEAL

104. The Directors shall provide for the safe custody of the seal which shall only be used by the authority of the Directors, and every instrument to which the seal shall be affixed shall either be signed by one Director and countersigned by the secretary or by a second Director or by some other person appointed by the Directors for the purpose. **Common seal of company**

DIVIDENDS AND RESERVES

105. The company in general meeting may declare a dividend, in cash and/or in specie, but no dividend shall exceed the amount recommended by the Directors. **Company may declare a dividend**
106. No dividend shall be paid by the company otherwise than out of profits or reserves of the company or in contravention of section 248(2) of the Ordinance. **Dividend payable from profit only**
107. The Directors may from time to time pay to the members such interim dividend as appear to the Directors to be justified by the profits of the company. **Interim dividend**
108. The profits of the company available for appropriation / distribution after making such provisions and transfers to reserve as shall be required to meet expenses or anticipated expenses of the company, subject to the provisions of the Ordinance, shall be appropriated and distributed periodically and/or annually by way of dividend, subject to the needs and liquidity position of the company as recommended/determined by the directors to the members of the company in accordance with respective shareholding. **Reserve fund**
109. When any shareholder is indebted to the company, all dividends payable to him or a sufficient part thereof, may be retained and applied by the directors in or towards satisfaction of the debt. **Dividends to shareholder, indebted to the company**
110. Any dividend, interest or other moneys payable in cash in respect of shares may be paid by cheque or warrant sent through the post, direct to the registered address of the holder or, in the case of joint-holders, to the registered address of that one of the joint-holders who is first named in the register on to such persons and to such address as the holder or joint-holders may in writing direct. Every such cheque or warrant shall be made payable to the order of the person to whom it **Payment of Dividend**



is sent. Any one or more joint-holders may give effectual receipt for any dividends, bonuses, or other moneys payable in respect of the shares held by them as joint-holders. The dividend shall be paid within the period laid down in section 251 of the Ordinance.

111. Unpaid dividends shall not bear interest against the company.

Unpaid dividend shall not bear interest

CAPITALIZATION OF PROFITS

112. The company in general meeting may, upon the recommendation of the Directors, resolve that it is desirable to capitalize any part for the time being of the company's reserves or accumulated profits otherwise available for distribution, and accordingly that such sum be set free for distribution amongst the members who would be entitled thereto if distributed by way of dividend and in the proportion on condition that the same be not paid in cash but be applied in paying up in full un-issued shares of the company to be allotted and distributed/credited as fully paid up to and amongst such members in the proportion aforesaid, or partly in the one way and partly in the other, and the Directors shall give effect to such resolution.

Capitalization of profit

ACCOUNTS

113. The Directors shall cause proper books of accounts to be kept as required by section 230 of the Ordinance.

Books of account

114. The books of account shall be kept at the registered office of the company subject to section 230 of the ordinance and shall be open to inspection by the Directors during business hours.

Location of books of account

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

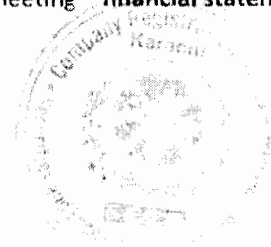
Inspection of books of account

116. The Directors shall, as required by sections 233, 234 and 236 cause to be prepared and be laid before the company in general meeting such financial statements duly audited and reports as are referred to in those sections.

Preparation of annual financial statements and report

117. The financial statements referred to in article 115 shall be made out in every year and laid before in the company's annual general meeting

Presentation of financial statements



made up to a date not more than four months before such meeting. The financial statements shall be accompanied by a report of the auditors of the company and the report of the Directors.

and reports before the company at the annual general meeting

118. The Financial statement shall be audited by the auditors of the company and shall be accompanied by a report of the directors under section 236 of the Ordinance as to the state and condition of the company and as to the amount which they recommend to be paid out of the profits by way of dividend to the members, and the amount, if any, which they propose to carry to one or more reserves according to the provisions in that behalf herein contained. Every report of the Directors, shall be signed by the Directors in accordance with sections 236 and 241 of the Ordinance.

Directors' reports

119. A copy of the financial statements together with reports of directors and auditors shall, at least twenty one days preceding the annual general meeting, be sent to the persons entitled to receive notices of general meetings in the manner in which notices are to be given hereunder and a copy thereof shall be deposited at the registered office of the company for the inspection of members for a period of twenty one days prior to such meeting.

Copy of financial statement and reports to be served on registered holder

120. Auditors shall be appointed and their duties regulated in accordance with sections 252 and 255 of the Ordinance or any statutory modifications thereof for the time being in force.

Auditors

NOTICE

121. A notice may be given by the company to any member either personally or by sending it by post, courier, e-mail, telefax or telex to his registered address. Where a notice is sent in any manner aforesaid, service of the notice shall be deemed to be effected by properly addressing, prepaying posting, delivering, transmitting, as the case may be, a letter containing the notice, and unless the contrary is proved, to have been effected at the time at which the letter would be delivered in the ordinary course of post/delivery/transmission.

How notice to be served on members

122. A notice may be given by the company to the joint-holders of a share by giving the notice to the joint-holders named first in the register in respect of the share and a notice so given shall be sufficient notice to all the holders of such shares.

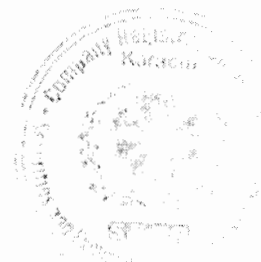
Notice to joint-holders



123. A notice may be given by the company to the persons entitled to share in consequence of the death or insolvency of a member thorough the post in a prepaid letter addressed to them by name or by the title or representatives of the deceased, or assignee of the insolvent or by any like description, at the address (if any) in Pakistan supplied for the purpose by the persons claiming to be entitled, or (until such and address has been so supplied) by giving the notice in any manner in which the same might have been given if the death or insolvency had not occurred. **Notice to persons entitled by transmission**
124. Notice of every general meeting shall be given at least 21 days before the date fixed for the meeting in the manner herein before authorized to (a) every member of the company, except those members who have no registered address or have not supplied to the company and address for the giving of notice to them, and also (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 (c) by publication as required under section 158(3) of the Ordinance if the company becomes a listed company, and (d) to the auditors of the company. **Notice General Meeting**

WINDING UP

- 125(1) Subject to the provisions of the Ordinance, if the company is wound up, the liquidator may, with the sanction of a special resolution of the company and any other sanction required by the ordinance, or by the court, 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. **Division of assets**
- (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 contributions as the liquidator, with the like sanction, thinks fit, but so that no members shall be compelled to accept any shares or other assets, securities whereon there is any liability.



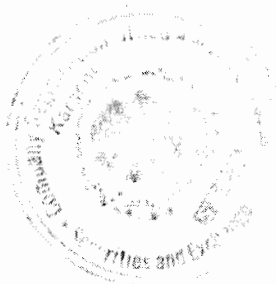
SECRECY

126. Save as otherwise provided in the ordinance no member or other person (not being a director) shall be entitled to visit and inspect any of the company's premises or properties of the company without the permission of the directors or to require discovery of or information respecting any detail of the company's trading or manufacturing or any matter whatsoever which may relate to the conduct of the business of the company and which in the opinion of the Directors will be expedient in the interest of the members of the company not to be communicate. **Secrecy**

DISPUTE RESOLUTION

127. In the event that a dispute, claim or controversy arises between the company, its management or its shareholders, or between the shareholders inter-se, or the directors inter se, all steps shall be taken to settle the dispute and resolve the issue through mediation by an accredited mediator before taking recourse to formal dispute resolution such as arbitration or litigation at the first instance, However, if the parties deemed fit the matter can be directly referred to arbitration or litigation as the case may be. **Dispute Resolution**

ARBITRATION



128. Whenever any difference arises between the company on the one hand, and any of the members, their executors, administrators, or assigns on the other hand, touching the true intent or construction, or the incidents or consequences of these presents, or of the statutes, or touching anything then or thereafter done, executed, omitted or suffered in pursuance of these presents, or of the statutes or touching any breach or alleged breach of these presents, or any claim on account of any such breach or alleged breach, or otherwise relating to the premises, or to these present, or to any statute affecting the company, or the premises, or to these presents, or to any statute affecting the company, or to any of the affairs of the company, every such difference shall be referred under the Arbitration Act 1940, to the decision of an arbitrator to be appointed by the parties in differences, or if they cannot agree upon a single arbitrator, to the decision of two arbitrators, of whom one shall be appointed by the company and the other by the parties in difference, or an umpire to be appointed by the two arbitrators. The cost of, and incident to, and such reference and award shall be in the discretion of the arbitrators, or umpire respectively, who may determine the amount thereof, or direct the same to be taxed as between attorney and client or otherwise, and may award by whom, and to whom, and in what manner the same shall be borne and paid.

Arbitration

MISCELLANEOUS

129. If the provisions of these Articles are in any way inconsistent with provisions of the Ordinance, or any other law for the time being in force, the provisions of the Ordinance or that other law shall prevail, and these articles shall be read subject to that ordinance of that other law.

**Companies
Ordinance to
prevail**



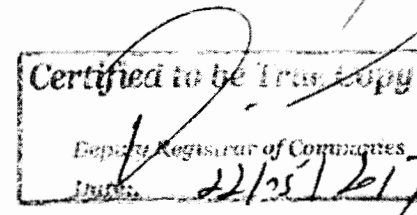
We, the several persons, whose names and address are subscribed below, are desirous of being formed into a company in pursuance of the **Articles of Association** and we respectively agree to take the number of shares in the capital of the company set opposite our respective names.

1	2	3	4	5	6	7	8
NAME AND SURNAME (PRESENT AND FORMER) IN FULL (IN BLOCK LETTERS)	FATHER'S/ HUSBAND'S NAME IN FULL	CNIC/PASSPORT/ REGISTRATION NUMBER	NATIONALITY WITH ANY OTHER FORMER NATIONALITY	OCCUPATION	RESIDENTIAL ADDRESS IN FULL	NUMBER OF SHARES TAKEN BY EACH SUBSCRIBER	SIGNATURE
1. SULTANA SIDDIQUI	QAZI IMDAD ALI	42301-0758819-2	PAKISTANI	BUSINESS	B-72, NAVEL HOUSING SOCIETY, ZAMZAMA, CLIFTON, KARACHI	10,000 (TEN THOUSAND)	
2. SHUNAID QURESHI	SHAFI MUHAMMAD QURESHI	42301-8863533-9	PAKISTANI	BUSINESS	B-72, NAVEL HOUSING SOCIETY, ZAMZAMA, CLIFTON, KARACHI	80,000 (EIGHTY THOUSAND)	
3. LIAQUAT ALI	SIFTUDDIN	33100-3432015-3	PAKISTANI	PROFESSIONAL	HOUSE # 916-C, CANAL VIEW HOUSING SOCIETY, MULTAN ROAD LAHORE	10,000 (TEN THOUSAND)	
						100,000 (ONE HUNDRED THOUSAND)	



Dated the 18th day of May 2017

Witness to above signature: Securities & Exchange Commission of Pakistan



PROSPECTUS

PROSPECTUS

BRIEF INTRODUCTION OF THE APPLICANT

M/s Ranpuri Sugar Mills (Pvt) Ltd (RSML), Ranipur, Taluka Kot Digi, District Khairpur, Sindh, is engaged in the manufacturing/sale of sugar with crushing capacity of 8000 TCD (tons cane crushing capacity per day) and capacity to generate Approx. ± 60 MW power by developing of Power Plant based on high pressure boilers technology and increasing its crushing capacity to 12,000 TCD.

M/s RSML has already been operating and maintaining a Bagasse based power plant running on low pressure boiler technology to meet with its own steam and power requirements successfully.

Keeping in view its present crushing capacity and planning to enhance it, the BoD of M/s RSML resolved to develop a new Approx. 60 MW Bagasse/Biomass based Co-Generation Power Project as a separate entity for power generation to meet with power and steam requirements of RSML and sale of spillover power to national grid. Consequent thereupon, a new power company under the name and style of "Ranipur Energy (Pvt) Limited" (REL) has been got incorporated with SECP.

In line with its goal, M/s REL has planned to develop a new Bagasse/Biomass based Approx. 60 MW Cogeneration Power Plant on high pressure technology boilers to meet with steam/power requirements of M/s RSML and sale of spillover power to national grid.

The proposed Approx. 60 MW Bagasse/Biomass based Cogeneration Power Project shall be developed by M/s REL under and pursuant to the GoP's Policy for Development of Renewable Energy for Power Generation read with Framework for Power Co-generation 2013 (Bagasse/Biomass) and Upfront Tariff determined by NEPRA for new Bagasse based Co-generation Projects in May, 2013 (modified in July, 2015).

SALIENT FEATURES OF THE FACILITY FOR WHICH LICENSE IS SOUGHT

The Facility shall employ 60 MW Steam Turbo Generator (STG) for power generation. The generated power shall be dispatched to the National Grid at 132kV level at SEPCO's 132 kV Gambat Grid Station which is located at distance of about seven (7) Kilometers from the premises of REL. A dedicated 132kV Double Circuit Transmission Line shall be got constructed from SEPCO by extending interest free loan by REL.

1	Plant location	Taluka Kot Digi, District Khairpur, Sindh, Pakistan
2	Plant Capacity	60 MW (Gross)
3	Technology	Conventional steam power cycle
4	Installed capacity	60,000 KW (Gross)
5	Plant details i. Steam Turbo generators ii. Boiler	1 x 60 MW Extraction/Condensing type Steam Turbine Generator 1 x 250 - 275 ton/hr, 110-125 bar, 540°C High Pressure Boiler

The company shall opt for the upfront tariff for New Bagasse Based Co-Generation projects determined by NEPRA in May 2013 under the Framework for Power Cogeneration 2013 for Bagasse/Biomass to include bagasse/biomass under the ambit of the Renewable Energy Policy, 2006.

PROPOSED INVESTMENT

The proposed investment is expected to be approximately US\$ 84 Million and shall be made through 80% bank loan and 20% equity.

SOCIAL AND ENVIRONMENTAL IMPACT OF THE PROPOSED FACILITY

Bagasse is a by-product produced during the sugar manufacturing process and is an environmental friendly biomass fuel and helps reduce emission of Green House Gasses. Governments across the Globe including Pakistan and neighboring India have incentivized biomass based generation to reduce the effects of Global Warming and to promote the use of indigenous energy sources for electricity generation.

Bagasse based generation like REL, provide the following benefits:

- Import substitution by replacing costly furnace oil, saving precious foreign exchange. It is estimated that approximately 3,000 MW can be generated by sugar mills located in various parts of the country.
- Contributing towards reducing the electricity shortfall during the low generation months as sugar mills operate in the winter months i.e. non-gas and non-hydel months
- Since Bagasse based generation offers direct replacement for furnace oil/diesel based generation it offers a clear price advantage.
- Environment friendly nature of the fuel helps in reducing Green House Gases and Carbon Footprints.

- The Project will use a high pressure boiler to generate electricity for sale to the national grid. The higher steam parameters shall result in more energy dispatch from the same fuel.
- Reducing distribution costs. Sugar Mills are located in rural areas and are vastly spread and, therefore, are ideal vehicles for cheap distribution of power to rural areas and non-traditional load centers.

PLANT DETAILS

Plant Details

1. General Information

(i)	Applicant's Name	Ranipur Energy (Pvt) Limited
(ii)	Registered Office	C-98, Kehkashan Scheme No.5, Block No.2, Clifton, Karachi
(iii)	Plant Location	At Ranipur Sugar Mills Limited, Taluka Kot Digi, District Khairpur
(iv)	Type of Generation Facility	Bagasse fired Cogeneration Power Plant
(v)	Expected Commissioning/Commercial Operation Date	18months from Financial close
(vi)	Expected Life of the Facility from Commercial Operation/Commissioning	30 years (Minimum)
(vii)	Expected Remaining Useful Life of the Facility	30 years (Minimum)

2. Plant Configuration

(i)	Plant Size Installed Capacity (Gross ISO)	60 MW (Gross)
(ii)	Type of Technology	Cogeneration Power Plant with high pressure boiler and Steam Turbine
(iii)	Number of Units	One
(iv)	Boiler	250-275 TPH approximately, High pressure 110-125 bar (a)
(v)	Steam Turbine	Steam Turbine - Extraction cum condensing type 60 MW.
(vi)	Installed Capacity	Power Generation: 60 MW (Season operation) 60 MW (Off-season operation)

(vii)	Auxiliary Consumption	10% approx.
(viii)	Designed Efficiency of the Plant (%)	25%
(ix)	Gross Efficiency of power plant at Mean Site Conditions (%)	26%
(x)	Net Efficiency of Plant at Mean Site Conditions (%)	24%
(xi)	Interconnection	07 km 132kV Transmission Line from proposed project site with 132 KV SEPCO's 132kV Grid Station Gambat

3. Fuel / Raw Material Details

(i)	Primary Fuel	Bagasse
(ii)	Alternate Fuel	Bagasse/ biomass
(iii)	Fuel Source (Imported/Indigenous)	Indigenous
(iv)	Fuel Supplier	Ranipur Sugar Mills (Pvt) Limited / from local market
(v)	Supply Arrangement	Through conveyor belts/loading trucks/tractor trolleys etc.,
(vi)	Sugarcane Crushing Capacity	8,000 TCD
(vii)	Bagasse Generation Capacity	2,400 Tons per day (TPD)
(viii)	Bagasse Storage Capacity	Bulk Storage
(ix)	Number of Storage Tanks	Not Applicable, Bagasse shall be stored in open yard

4. Emission Values

Emission values will remain in the limits prescribed by the National Environment Quality Standards (NEQs).

5. Cooling System

(i)	Cooling Water Source / Cycle	Deep Bore well water/ Cooling Towers
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6. Plant Characteristics

(i)	Generation Voltage	11000 volts
(ii)	Frequency	50 Hz
(iii)	Power Factor	0.8 Lagging, 0.95 Leading
(iv)	Automatic Generation Control (AGC)	By Turbine Governing System
(v)	Ramping Rate	10% of full load per minute (approx.)
(vi)	Estimated Time Required to Synchronize to Grid.	<div>During cold start (i.e. when plant is started later than 72 hours after shutdown)</div> <div>During warm start (i.e. when plant is started at less than 36 hours after shutdown)</div> <div>During Hot start (i.e. when plant is started at less than 12 hours after shutdown)</div>

Note:

All the above figures are indicative in nature. The Net Capacity available for dispatch will be determined through procedure(s) contained in the Energy Purchase Agreement, Grid code or any other applicable document(s).



CONTROL, METERING & INSTRUMENTATION



Control, Metering, Instrumentation & Protection

The plant will have an internal control, metering, and protection system and can be monitored locally and/or from remote locations by using DCS system.

In addition to this, the plant and equipment for the new proposed Cogeneration system will consist of the high pressure boiler, extraction condensing steam turbine, water cooled condensing system, Main and auxiliary cooling water system, Main and Back up metering panels, Protection panels, water treatment plant system, condensate and feed water system, compressed air system and electrical system consisting of switchgears, LT distribution panels, Variable Frequency Drives, step up transformer to export the power, step down transformers for meeting the in-house power requirement, outdoor switchyard equipment etc.

All the Grid Station, Protection, Telecom, Metering and Control systems shall be as per Technical Schedules of Energy Purchase Agreement.

EMERGENCY PLAN

EMERGENCY PLAN

A comprehensive emergency plan would be implemented to meet unexpected situation to ensure zero injury, damage or loss of any life/property.

Key features of the emergency plan are as follows;

- **Emergency Escapes/Evacuation Plan**

A comprehensive evacuation plan will be prepared and emergency escape procedure and route maps will be displayed at prominent places in the facility. All personnel at the facility shall be made aware of Emergency escape routes and procedures for a quick and safe escape.

- **Awareness of Different Types of Emergencies**

All personnel at the facility shall be educated on how to react to each type of emergency. All staff working at the facility will be given detailed briefing regarding different types of emergencies and their response so that they would be able to identify emergency situations.

- **Training to React to an Emergency Alert Alarm**

All personnel at the facility shall be trained to react to each emergency to take necessary measures of safety and protection at the earliest.

- **Emergency Equipment**

In addition to emergency combatants training, emergency equipment like fire extinguishers and fire hydrants will be provided at the facility to tackle with different types of Emergency.

- **Use of Safety Gears and Equipment**

The staff working at the facility will be given with proper information, guidance and training about the use the safety gears and equipments.

- **Emergency Alarm**

Easy access to emergency alarms shall be provided to raise the alarm in case of any type of Emergency.

Emergency Numbers

Emergency call numbers shall prominently be displayed at prominent places in the facility.

- **Emergency Response Team**

A well equipped and specialized team will be formed which will be responsible to take all necessary measures and decisions to deal with the emergency and provide relief, support and first aid to the effected staff. The emergency response team will also be responsible for the evacuation of personnel and material from the premises.

- **Emergency Shutdown**

The Emergency response Team shall be responsible to ensure immediate shutdown of the operational systems and equipments if required in the Emergency.

- **Assembly Areas and Muster Points.**

Designated assembly areas / Muster points shall be identified and all personnel working at the facility will be educated to muster at the designated assembly area / muster points in the event of an evacuation for head count.

- **Ambulances**

Availability of Ambulance/Vehicle at the facility shall be ensured for causality evacuation to the hospitals.

SAFETY PLAN

To provide a safe working environment, the company shall follow a well devised safety plan.

Key features of safety plan are given below:

- **Awareness**

Staff working at the facility shall be given information to help them to identify the risks and take necessary measures of safety and protection during their working. To create awareness, personnel at the facility shall be briefed through handouts, in-house seminars, mock safety drills. Particular areas of interest shall be:

- - Moral Obligation
 - Hazard Recognition
 - Importance of Personnel Protective Equipment (PPEs)
 - Accident Prevention
 - Importance of House Keeping
 - Machine Guarding
 - Fire Prevention
 - Fire Protection
 - Fire Fighting

- **Use of Safety Gear and Equipment**

Use of PPEs like safety helmet, safety shoes, uniform, dust mask, ear plugs, ear muff, gloves for their safety shall be issued to all personnel.

- ○ **Assurance of use of Safety gear**

The staff working at the facility will be provided all necessary safety gears and protection equipment and its use shall be mandatory during work.

- **Emergency Alarms**

Automatic Emergency Alarms shall be installed at all fire hazardous locations of the plant site.

- **Emergency Numbers**

Emergency call numbers shall prominently be displayed in bold at prominent places in the facility.

- **Emergency Shutdown**

The Emergency response Team shall be responsible to ensure immediate shutdown of the operational systems and equipments if required in the Emergency.

- **First Aid Facilities**

The availability of first aid facilities to provide urgent and immediate first aid will be ensured at the facility.

- **Ambulances**

Availability of Ambulance/Vehicle at the facility shall be ensured for causality evacuation to the hospitals.

- **Mock Fire Drills**

To keep fire brigade staff in good practice, mock fire drill will be executed by creating mock emergency situations.

- **Fire Fighting System**

The fire protection system or equipment will be provided for early detection, alarm, containment and suppression of fire. A comprehensive fire protection system has been planned to meet the above objective. A multitude system shall be provided to combat various types of fire in different areas of the plant.

The complete fire protection system shall comprise of following;

- Stand pipe & hose system for building and structure
- Yard main, hydrants and monitors of plant site
- Fire alarm and signaling
- Portable fire extinguishers

The system shall be designed generally as per NFPA (National Fire Protection Association) standards.

Training and Development

Training and Development programmes for our Engineers and Supervisory staff arranged. Engineers and Supervisory staff who will successfully complete the Training program can:

1. Understand the principles, components and measuring instruments associated with AC and DC electricity
2. Understand the operation and control of the common motors and generators found in utilities
3. Differentiate between distribution and power transformers by construction and application
4. Discuss the application of protective relays to protect motors, generators, buses and transformers
5. Understand the purpose and operation of the various equipment used in electric power generating stations
6. Describe the functions of the equipment used in power distribution stations
7. Explain the principles of operation of the various types of steam generators
8. Describe the methods used to regulate the voltage of distribution systems
9. Explain the principles of operation of the various types of steam generators
10. Describe the methods used to regulate the voltage of distribution systems
11. Understand H.P Valve Operation
12. Understand H.P line and routing
13. Understand DCS process operation
14. Understand H.P Boiler starts up and Shut Down
15. Understand Turbine start up and operations
16. Understand High Voltage Equipments
17. Understand Safety for smooth operations

We shall also arrange technical workshops/seminars to address all Core Operations. These training can be in-house from a qualified Instructors and experienced professionals or can be outsource to a well-developed and professionally competent firms.

Benefits of this training and development programme

a) Reduce Human Errors

Well trained personnel make fewer mistakes. Possible malfunctions and defective components can be recognized earlier and preventive maintenance measures can be put into place.

b) Increase Availability

Power station staff that is able to perform quickly and accurately can help to prevent or minimize forced outage times and thus increase the plant availability.

c) Health and Safety

The awareness of possible dangers in the plant and the safe operation of any equipment is essential. Training ensures a full understanding of the plant and its systems functionality and proper handling in order to prevent any hazards and threats.

d) Motivated Personnel

Staff that has been trained well has a better understanding of the requirements to be met every day. Higher skill levels and know-how lead to better performances on the job and communication within the team. This creates a very professional environment and thus a highly motivated and satisfied work force.

e) Long Term Payback

A well defined training concept with continuous skill development programs and clear learning targets will guarantee satisfying performances of our personnel. This long term approach will ensure the successful productivity of our power station.

PROJECT COST

PROJECT COST AND SOURCES

1. Methodology of the EPC Cost estimate

It is assumed that the project will be executed through the package route with the Supply Contractor carrying out the Engineering, Procurement and Construction Management activities. The Supply Contractor shall make the basic design of the plant, prepares the specifications and assists REL in the finalization of the packages. Once the packages are ordered, the Supply Contractor shall expedite with the contractors, reviews drawings, co-ordinate all the activities between the contractors and manage the implementation of the project. The complete Cogeneration plant civil works will be executed by a local contractor.

2. Installed Project Cost

The Project Cost for the implementation of the 60 MW cogeneration plant at REL, has been estimated as US\$ 84 Million.

3. Arrangement of Funds

The funds shall be arranged through REL's equity and debt @ 20% and 80% respectively following the provisions provided in the Upfront Tariff determined by National Electric Power Regulatory Authority (NEPRA) for new Bagasse based Cogeneration Projects in May 2013 (modified in July, 2015).

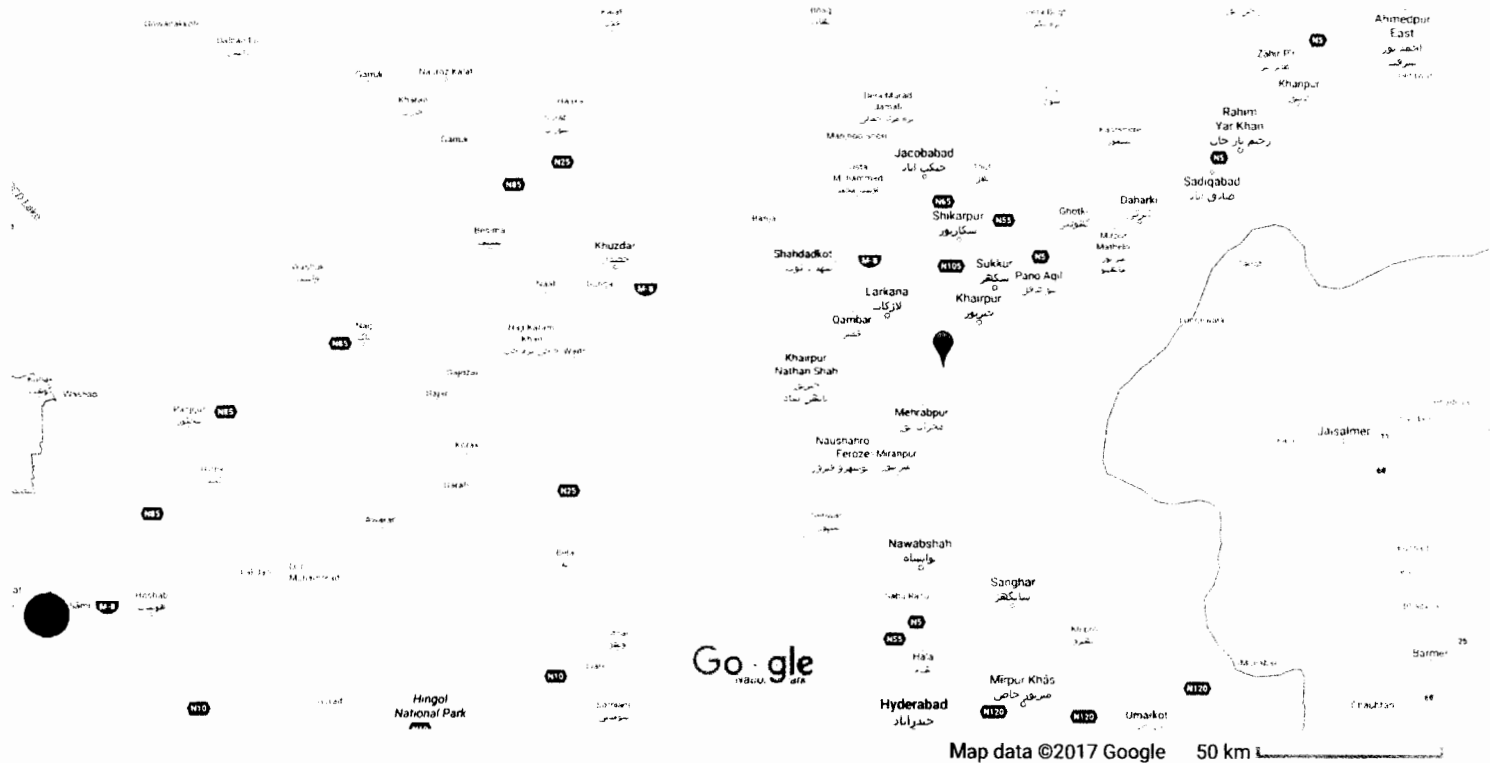
PROJECT LOCATION

LOCATION OF COGENERATION POWER PLANT
RANIPUR ENERGY (PVT) LIMITED

The proposed Cogeneration Power Plant of M/s Ranipur Energy (Pvt) Limited is located at M/s Ranipur Sugar Mills Limited, Taluka Kot Digi, District Khairpur, Province of Sindh.

The geographical locations maps showing altitude and longitude of the proposed site are enclosed herewith.

Go gle Maps Ranipur Sugar Mill



● Ranipur Sugar Mill
National Hwy
Pakistan



INFRASTRUCTURE

INFRASTRUCTURE

The road and infrastructure can be subdivided as:

Main highway

M/s Ranipur Energy (Pvt) Limited can be accessed from the main National Highway NH-5 passing nearby the premises of M/s Ranipur Sugar Mills (Pvt) Limited.

Railway Station

The nearest railway station is Ranipur, which is at the distance of around 04 km from the premises of M/s Ranipur Sugar Mills (Pvt) Limited.

Airport

Sukkur Airport is around 75 km away from the premises of M/s Ranipur Sugar Mills (Pvt) Limited.

Hospital

Nearest Hospital is at Gambat which is approximately 25 km away from M/s Ranipur Sugar Mills (Pvt) Limited.

Nearest City

Nearest city is Gambat 25 km away from the premises of M/s Ranipur Sugar Mills (Pvt) Limited.

PROJECT SCHEDULE

C-98, Kehkashan Scheme No.5, Block No.2, Clifton, Karachi

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INTERCONNECTION ARRANGEMENT

INTERCONNECTION ARRANGEMENT
FOR THE DISPERSAL OF POWER FROM THE
POWER PLANT OF M/S RANIPUR ENERGY (PVT) LIMITED

The Power generated by M/s Ranipur Energy (Pvt) Limited (REL) from its Bagasse based Thermal Power Generation facility shall be dispersed to the Load center of Sukkur Electric Power Company Limited (SEPCO).

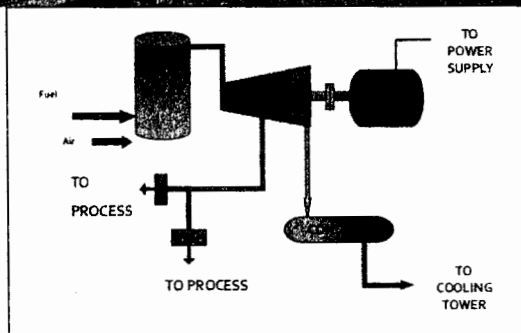
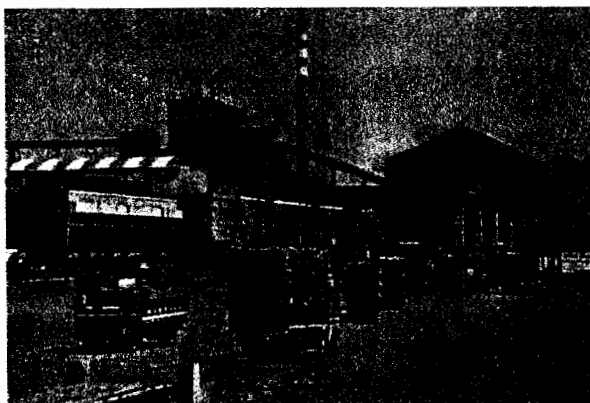
SEPCO's 132 kV Gambat Grid Station is located at distance of about seven (7) Kilometers from the premises of M/s Ranipur Sugar Mills (Pvt) Ltd (RSML). A dedicated 132kV Double Circuit Transmission Line shall be got constructed from SEPCO on Deposit Work Basis by extending interest free loan to SEPCO by m/s REL. Accordingly M/s REL's proposed Cogeneration Project will comfortably be connected to the national grid through the said proposed 132kV RSML - Gambat Transmission Line.

The Grid Interconnection Study Report has been prepared by M/s Power Planners International (PPI) Lahore and shall be submitted to NTDCL in due course for vetting/approval.

A copy of Grid Interconnection Study Report is placed at Annex-"A".

FEASIBILITY STUDY REPORT

60 MW Cogeneration Power Project by Ranipur Energy (Pvt) Limited Located at Ranipur Sugar Mills, Taluka Kot Digi, District Khairpur, Sindh



April, 2017

PROJECT MANAGEMENT TEAM
Ranipur Energy (Pvt) Limited

Executive Summary

1.0 Introduction

- 1.1 The project will play an important role on the country's economic development, as more power will be available for use to offset the deficit of power supply in the country. The provision of renewable electricity is a major factor contributing to sustainable development. Rural electrification which could result from this project would have far reaching impacts on livelihoods in the rural community where the factory is located and where more jobs would be created.
- 1.2 The national grid generally is in a deficit situation, especially during the winter season when thermal plants are used to fill in. A more stable, renewable and local supply of electricity should permit displacement of carbon-intensive power generation and/or expansion which is not only adversely affecting the environmental but also expensive and slows down overall economic growth in Pakistan. The energy sources for the country would be more diversified and secured by the domestic energy supply.
- 1.3 In addition, the project will save the country significant foreign exchange that would have been used for the importation of fossil fuels for the thermal plants which are used to address marginal power shortfalls. The savings can then be channeled to other more useful economic activities leading to economic growth of the country. The project will make positive contribution to the country's implementation of its energy strategy which aims to reduce energy from thermal sources and increase energy from renewable sources. The country now relies on hydro and fossil fuel based electricity, which are sometimes affected by rainfall patterns and erratic fuel price fluctuations, respectively and the project will stabilize the supply of renewable energy during winter season and irrespective of fossil fuel prices.
- 1.4 The creation of a more viable agricultural sector is crucial to the development of the national economy and the maintenance of livelihoods where over 70% of the population lives in the rural areas where agriculture is the main source of employment. Agriculture also contributes significantly to the country's GDP.

- 1.5 The environmental benefits do not only include GHG emission reductions, but also reduced steam generation with higher efficiency resulting in twice the amount of power generated. The elimination of particulate matter in the boiler exhaust, which will be fitted with an electrostatic precipitator under the project, will result in improved air quality in the area.
- 1.6 The implementation of the project will offer local people skills in high pressure cogeneration technology and will act as a clean technology demonstration for the other local sugar mills.
- 1.7 Bagasse based Cogeneration, for additional power generation in sugar industry, offers a number of advantages both to the sugar company and to the country. Bagasse based Cogeneration is being extensively used in India where the installed generation capacity is more than 1800 MW with more plants under implementation. The other countries that had exploited bagasse based Cogeneration to a major extent are Mauritius, Reunion Island and Brazil etc.

2.0 Background

- 2.1 Ranipur Sugar mills (RSML) operates its sugar mill in Khairpur district of the Sindh Province in Pakistan. This sugar mill has a capacity of 8000 Tonnes of Cane per day with utilization factor 90%, 300 (TCH), and crushing period of about 120 days in a year.
- 2.2 REL's sugar mill is modern and they have installed the most modern plant & machinery in the sugar mill. REL, with an excellent management team and the best machinery ensure good performance of the sugar mill and consequently the mill is among the top sugar mills in the Sindh Province in terms of sugarcane crushing, production, recovery and efficiency. REL is located in an excellent cane growing area of the Sindh Province. Located at Taluka Kot Digi, District Khairpur, Sindh. The mill has good access by road. The factory is about 25 kms from the city of Gambat. The nearest airport is at Sukkur and the nearest seaport is Karachi at a distance of about 450 km. The factory is well connected by road to Khairpur and Karachi through highway.
- 2.3 Considering the good cane potential in the command area of the sugar mill, REL is planning to enhance the crushing capacity of the sugar mill from 8000 TCD to 12000 TCD.

3.0 Project Rationale & Drivers

- 3.1 While expanding the crushing capacity of the sugar mill, REL is planning for the implementation of the high pressure Cogeneration program to generate grid quality exportable power. Even though the sugar mill operation with the existing steam and power generation system is quite comfortable, REL is contemplating high pressure Cogeneration due to the following reasons:
- Contributing to the growth of the country's economy by generating the much-needed electricity.
 - Helping to reduce the foreign exchange outflow by using a local renewable fuel, instead of the costly imported fossil fuel for generating electricity.
 - Putting an energy resource like bagasse to better use and maximizing the power generation with bagasse. The

bagasse, which is a renewable energy source, contributes to the reduction in the green house gases.

- Improving the Energy efficiency of the plant, as inefficiency in any form is to be eliminated in this energy deficient world.

- 3.2 With the stabilization of the crushing at 8000 TCD, the potential for additional power generation at REL is very good. With Cogeneration in mind, the company had taken adequate care in ensuring the sustainability of the crushing. To that effect REL has been concentrating on cane development to get assured cane for crushing. Also REL, with the view to enhancing the power export potential, is planning for conversion of the steam turbine drives of the mills and the cane preparatory devices to electric drives. They had already made adequate efforts in reducing the steam consumption and going in for the energy efficiency measure in the process area to reduce the thermal energy consumption. With these forward planning, the implementation of Cogeneration could become much easier in this sugar mill. With the implementation of the energy efficiency measures, there will be a remarkable reduction in the process steam and power consumption in the sugar mill, enhancing the energy export to the grid.
- 3.3 Currently Pakistan has an installed electric generating capacity of about 20,000 MW, with the demand far exceeding this installed capacity and the access to electricity in Pakistan is about 62%. With a fast-growing economy and demography, the projection for the demand in 2030 is forecast to be 100,000 MW. This calls for a tremendous growth rate in the power sector. The Government of Pakistan is making all out efforts to increase the generation capacity by tapping all conventional and non-conventional sources of electricity generation. Born out of this Government's initiative to augment the generation through non-conventional energy sources is the "National Policy for Power Cogeneration by Sugar Industry" promulgated in January 2008. The Government of Pakistan has recognized that Bagasse based Cogeneration can play a significant role in the country's efforts to augment the electricity generation.
- 3.4 The Government's pro-active policy on power Cogeneration created a lot of interest in the sugar Industry in Pakistan. The sugar Industry, suffering due to the vagaries of nature and global market fluctuations had been looking for support from the Government on

the cogeneration initiative. However after the initial euphoria, the policy aimed at laying down clear guidelines about tapping the bagasse based Cogeneration potential, did not evoke much of interest. The major probable reasons, why there was not much of enthusiasm, were the minimum size of 60 MW and the treatment of the Cogeneration plants as IPPs. With no sugar mill coming forward to implement the Cogeneration program, the sugar industry has taken up the matter with the Government and the new initiative by the industry and the Government has brought about a new policy framework in 2013 which promises great hopes for bagasse based Cogeneration in Pakistan. Under this new policy framework, five (5) power plants have already achieved successful commercial operation and contributing electricity to the national grid.

4.0 Project Sponsors

- 4.1 For the implementation of the Cogeneration program, RSML has set up a new company under the name and style of "Ranipur Energy Limited" (REL). REL will be undertaking the power project development, construction and operation activities. REL will sell power and steam to RSML for latter's operation and get bagasse in return from REL. REL will sign the Energy Purchase Agreement with the Central Power Purchase Agency (Guarantee) Limited (CPPA) – the Power Purchaser and sell the surplus power to the Power Purchaser. In the new company REL will be a major stakeholder.
- 4.2 The bagasse generation in the sugar mill is reasonably good, at 30% on cane, on account of the high fibre in cane, and the generated bagasse is not fully utilized presently. Even with the present crushing of 8000 TCD, REL saves and hence sells a lot of bagasse. The high crushing capacity and the high percentage of bagasse make this sugar mill an ideal candidate for the implementation of the Cogeneration program. Fully aware of the benefits of Cogeneration to the company as well as to the power starved country, REL has proposed the Cogeneration project and REL will take up the implementation of the Cogeneration project in sugar mill.
- 4.3 Under the present arrangement, the sugar plant's complete steam and power requirements of 8 MW are being met by existing low pressure boilers with matching turbines. In addition, there are quite a few steam turbine drives to drive the mills and the cane preparatory system devices, which are inherently inefficient. Under the Cogeneration program, the low-pressure boiler and the existing turbogenerators will be retired in phases. The drive turbines will be replaced by electric motors. The entire quantity of the steam and power requirements of the sugar plant will be met by the new Cogeneration plant.
- 4.4 REL being progressive has already initiated measures to make the sugar mill energy efficient and consequently the steam consumption in the process is 42% on cane. For a sugar mill producing refined sugar this is an appreciable achievement. The sugar mill is running comfortably as the total installed capacity for steam generation is adequate for meeting this requirement. Using

the steam generated, the mill is generating enough electricity to meet with all the internal requirements. This existing facility will meet with the requirements of the mill even with the enhanced crushing at 12000 TCD. REL had embarked on the energy conservation measures, to bring down the steam consumption to 42%, while the contemporary mills are consuming around 55. When the Cogeneration plant is installed and operating, the process steam consumption of the sugar plant will be 42% and only this quantity of steam is considered to be extracted from the Cogeneration plant.

- 4.5 With the establishment of the proposed Cogeneration project, RSML will enter into agreement with REL, the operator of the Cogeneration plant, for selling bagasse and buying power and steam.

5.0 Technology

- 5.1 For the proposed Cogeneration program REL is interested in going in for the proven latest technology. With the gasification of bagasse has still not attained full-scale commercial exploitation; the only technology available for using the bagasse is through the combustion route. The technology chosen is the conventional thermal power plant technology based on the Rankine Cycle. The bagasse will be combusted in a high-pressure boiler and the steam generated will be fed to the steam turbine to generate power. The turbine will be different from the conventional thermal power plants, as the turbine will be provided with a controlled extraction for extracting the process steam required for the sugar mill. To enhance the efficiency of operation, regenerative heaters are used in the feed water circuit. For the Cogeneration power plant proposed for REL, the Cogeneration cycle is based on the parameters of 110 - 125 bar(a) and 540 °C at the boiler outlet, currently being used in many countries for the Cogeneration projects except Pakistan. The cycle chosen with the above parameters is the latest used in any of the bagasse-fired installations around the world but first of its kind in Pakistan. These above selected parameters make the cycle more efficient and help in the generation of more units for the same quantum of the fuel. There are already a few Cogeneration plants operating in India with these parameters and the operating experience of those plants, in synchronization with the sugar mill operation, has been smooth and without any hitch. REL is planning to establish 1 x 250 - 275 TPH capacity boiler with 1 x 60 MW turbogenerator. Considering the off-season operation of the plant, the Cogeneration power plant boilers will be designed for firing the saved bagasse and a few other compatible biomass fuels.
- 5.2 Considering 120 days of crushing operation and an overall capacity utilization of 90%, the sugar plant will generate around 259,200 MT of Bagasse which shall be used for running the Cogeneration plant during the crushing period. The number of operation days in the off-season could be enhanced if bagasse from other sugar mills is purchased and also suitable compatible biomass fuel is identified. Even if the biomass fuel is available during the seasonal operation, it could be used along with bagasse and more quantum of bagasse could be saved for more number of days of operation in the off-season.

- 5.3 The power requirement of the sugar mill during the season operation, excluding the power requirements of the Cogeneration power plant is expected to be ± 8 MW. During the off-season period, the power requirement is estimated to ± 0.5 MW, mainly for meeting the power required for the off-season maintenance of the sugar plant machinery and for meeting the colony and office power requirements.
- 5.4 Considering the above, the exportable power to the national Grid comes to approximately 46 MW during season and approximately 53.5 MW during off-season.
- 5.5 Considering the huge investment and also the round the year power requirement of the grid, REL will operate the Cogeneration power plant in power plant mode both during season and off-season. The season operation of the Cogeneration plant consumes a lot of bagasse, but still leaves some surplus quantity for the off-season operation of the power plant. The plant will operate with the saved bagasse for a period of approximate ± 60 days (as per availability of bagasse). REL wants to operate the plant for approximately 300 days in a year for which bagasse would be purchased from other sugar mills and compatible bio-mass fuel like rice husk, wood chips etc. shall also be arranged.
- 5.6 The plant and equipment for the new proposed Cogeneration system will consist of the high pressure boiler, extraction condensing turbogenerator, water cooled condensing system, main and auxiliary cooling water system, water treatment plant system, condensate and feed water system, compressed air system and electrical system consisting of switchgears, LT distribution panels, Variable Frequency Drives, step up transformer to export the power, step down transformers for meeting the in-house power requirement, outdoor switchyard equipment etc.
- 5.7 The water requirement of the Cogeneration plant is proposed to be met mostly by the ground water through deep bore wells. The ground water aquifers get charged within boundary. The present raw water requirement of the sugar mill is being met by the drawl from these sources. The water from the bore wells will be stored in a new water reservoir, and drawn for usage in the Cogeneration plant. A water treatment plant based on the reverse osmosis principle is proposed for the treatment of the entire feed water for

the Cogeneration plant. There will be an adequately designed pre-treatment system with Multigrade filter and Ultra filtration system upstream of the RO plant.

6.0 Generation & Grid Interconnection

- 6.1 The bulk of the power generated in the proposed Cogeneration plant is meant for export to the grid. The power generation in the new Cogeneration TG will be at 11 kV level. The power plant's internal consumption requirement will be met by stepping down the voltage level to 0.4KV. Similarly the sugar mill's requirement will be met by stepping down the voltage from 11 KV to 0.4KV. However considering the stability and the uninterrupted export of power, the exportable power will be stepped up to 132 kV and paralleled with the national grid at 132 kV level. In the case of REL's Cogeneration plant, the paralleling with the grid will be done at the SEPCO's grid Sub-station at Gambat.

7 Implementation Schedule

- 7.1 The implementation of the proposed new Cogeneration system first phase is expected to be completed within Twenty (20) months, from the date of release of advance payment to the Supply Contractors. The Commercial Operation Date (COD) of the cogeneration project is expected to be in first quarter of 2019.
- 7.2 The size of the project calls for proper project management and control procedures to ensure implementation within the scheduled program. Adequate qualified and trained manpower shall be recruited to take care of the implementation of the new Cogeneration system. REL plans for engaging an Operation and Maintenance team to take over the O&M of the plant.
- 7.3 The project shall be executed through the package route with an EPCM consultants carrying out the Engineering, Procurement and Construction Management activities. The EPCM consultant shall make the basic design of the plant, divide the project into logical and manageable packages, prepare the procurement specifications and assists REL in the procurement of the packages. Once the packages are ordered, the EPCM consultant shall expedite with the contractors, reviews drawings, co-ordinate all the activities between the contractors and manage the implementation of the project. The

complete Cogeneration plant civil works will be executed by a separate contractor. Based on the overall project guarantees, individual package guarantees are arrived at and specified in the contracts of the individual packages.

8 Project Cost Estimate

The Project Cost for the implementation of the 1 x 60 MW cogeneration plant at REL will be US\$ 84 Million.

9 Conclusion

Bagasse based Cogeneration is being considered by many countries as an environment friendly way of augmenting the generation capacity. The Government of Pakistan has estimated a potential of 3000 MW of Cogeneration power from the existing sugar mills, and has decided to fast track these projects. REL's sugar mill with 8000 TCD of crushing per day will be able to sustain the generation of 25 MW of power in REL's Cogeneration plant in first phase for a period of about 180 days, with the bagasse generated in the mill. The proposed Cogeneration plant of REL, when implemented, will export a substantial quantum of power to the national grid. The proposed Cogeneration cycle is already proven and implementation of this project will benefit both the sugar mill and the country.

1.0 Cogeneration Plant Technology and Scheme Proposed for the Project

1.1 Cogeneration Plant Proposed for REL

The Cogeneration plant proposed of REL will be based on the boiler outlet steam parameters of 110 - 125 bar (a) and 540 °C. The plant will be capable of meeting all the process steam and power requirements of REL's sugar mill's expanded capacity at 12000 TCD crushing. Operating in parallel with the sugar mill and synchronizing with the national electricity grid and using the bagasse generated in the sugar mill during the season operation, the Cogeneration plant will export power to the sugar mill and to the grid. During the off-season the sugar mill does not operate but the Cogeneration power plant will operate, in full power generation mode, on the saved and / or purchased bagasse and / or on biomass fuel to export bulk of the power generated to the grid.

1.1.1 The nominal cane crushing capacity of the sugar plant, for designing the Cogeneration plant, will be 8000 TCD in 24 hours or 300 Tonnes of Cane per Hour (TCH). The plant will continue to be with the milling system for juice extraction.

1.1.2 The nominal crushing period for the REL's sugar plant will continue to be 120 days in a year. The plant crushes continuously for the above period and then the plant is taken for the off-crop maintenance. During the crushing period the plant will operate continuously but for occasional shutdowns for plant cleaning and maintenance and for reasons of non-availability of cane for short durations.

1.1.3 REL has done a lot of improvements in the operation of the sugar mill and consequently the sugar mill had been undergoing a lot changes. Depending on the cane availability and many other factors, there could have been a lot of ups and downs in the crushing and the actual factory time efficiencies recorded earlier will not be relevant. Considering the efforts being made by REL and cane development programs being initiated by them it is expected that the overall plant capacity utilization will not be less than 90% of 8000 TCD at the time of the Cogeneration programs implementation.

- 1.1.4 The average bagasse percentage on cane is 30% and a provision of 1.0% is made for meeting with the requirements of bagasse for vacuum filtration and to account for losses. The balance of 29% (on cane) of bagasse will be available for the operation of the Cogeneration plant. With 300 TCH of crushing the bagasse generated in the plant will be 90 TPH. Out of this 2.6 TPH of bagasse (about 3.33% of the bagasse generated) is set aside for meeting with the above indicated bagacillo requirements, losses and the start up requirements of the boiler and the balance is taken to be available for using in the Cogeneration plant. This much quantum of bagasse will be available in REL for sale to REL.
- 1.1.5 With the view to enhancing the export from the Cogeneration plant, REL/REL will be replacing the inefficient steam turbine drives in the sugar mill with electric motors drives. The mills that crush the cane are presently driven by steam turbines and the same will be replaced with electric motors.
- 1.1.6 The sugar mill presently operates low pressure boilers and turbines. With the commissioning of REL's Cogeneration plant, existing low pressure boiler and turbogenerator at REL will be retired in phases.
- 1.1.7 The Cogeneration plant boilers will be designed with a travelling grate with hydraulic drive to burn bagasse, and biomass fuels.
- 1.1.8 The proposed new turbogenerator will be of 60 MW nominal capacity. The turbine will be extraction condensing type machine.
- 1.1.9 The deaerator will be serving the dual purpose of deaerating the feed water as well as heating the feed water, to raise its temperature, with the extraction steam. The deaerator will be operating with the deaerated feed water temperature. The deaerator will receive the condensate from the surface condenser, the condensate of the heating steam from the sugar process and the feed water make up. The condensate of the heating steam from the feed water heaters will be cascaded to the deaerator, to optimally use the energy in the feed water heating steam.
- 1.1.10 Once the Cogeneration program is implemented, process steam requirement of the sugar mill will be partially catered by the steam drawn from the turbine extraction. Suitably sized pressure reducing

- and de-superheating stations will be provided for meeting the process steam requirement of REL, in case of any problem in drawing the steam from the turbine extraction. The turbine extraction could get disabled when there is a grid failure and the turbine is forced to operate only for meeting the house loads.
- 1.1.11 The exportable power will be stepped up to 132 kV and will be connected to the nearby SEPCO's grid station at Gambat through double circuit overhead transmission lines.
- 1.1.12 Presently there will be no distillery or any other chemical process plant with in the complex of the sugar mill, However, for the present, the extractions from the Cogeneration plant turbine will just meet with the requirements of the sugar mill process only.
- 1.1.13 The primary responsibility of the Cogeneration plant, during the season operation, is to provide the process steam and the required electrical energy to the sugar mill. The export of power to the grid comes after meeting with the above in-house requirement. As the bagasse percentage in cane is quite high, even after meeting with the requirements of the operation of the new Cogeneration plant there will be some surplus bagasse left. This surplus bagasse will be used for the operation of the Cogeneration plant during the maintenance days and also during the off-crop period. Once the Cogeneration plant is commissioned even if the sugar mill stops for maintenance work, the power plant will keep running. During such periods of running, there will be no requirement of process steam and the Cogeneration plant will essentially operate in a condensing mode and will generate power to supply in national grid.

1.2 Auxiliary Plant and Equipment

- Fuel handling
- Ash handling
- Cooling Tower
- Pumps
- Condensate System
- DM / RO Plant
- Crane for the Turbogenerator Building
- Vessels & Heat Exchangers
- Tanks
- Compressed Air System

1.2.1 Piping

All piping system shall be designed as per prescribed standard. In addition, statutory requirements of Pakistan Boiler Regulations shall be complied with. All piping shall be sized considering the allowable velocity and allowable pressure drop in the system.

1.2.2 Insulation

All exposed portions of the plant which operate at temperatures of 60°C and above during normal operation shall be thermally insulated so that the temperature on the outer surface of the cladding shall not exceed by more than 20°C above ambient, based on an ambient temperature indicated in site data. The specified insulation thickness shall not include the thickness of wire netting, finishing cement or any other finishing or weatherproofing application. Insulation shall not fill the contours of the expansion bellows. Piping and equipment that are not insulated but having a surface temperature exceeding 50 °C shall be insulated for personnel protection. In refractory walls suitable expansion gaps shall be provided at regular intervals.

1.2.3 Ventilation System and Air Conditioning system

The following areas will be envisaged with exhaust ventilation system:

- TG hall
- Water Treatment plant Equipment room

- Chemical Storage area in WTP (water treatment plant) building
- Muffle furnace, Hot oven, etc room in WTP building
- WTP MCC panel room
- Fire Pump House
- Toilets

The exhaust ventilation system will maintain the temperature rise within 5 °C above ambient temperature.

The following areas of power plant will be envisaged with Ductable type, ceiling suspended air conditioning system:

Auxiliary MCC panel rooms in TG building
Control Room in TG building
Battery room

The following areas of power plant will be envisaged with Hi-Wall split air conditioning system:

SWAS panel room in TG building
WTP DCS operator station room in WTP building
WTP laboratory room in WTP building
Office and Conference Room

The air conditioning system will maintain a temperature of 22 ° C inside the rooms.

1.2.4 Fire Fighting System

The following fire fighting systems will be envisaged for the power plant:

Fire Hydrant system for the entire power plant including fuel storage areas.

Automatic Fire detection and alarm system for the TG building
Portable Fire extinguishers for the TG building.

High Velocity water spray system for Switch Yard Transformer

The fire hydrant system shall consist of two numbers of pumps (one working and one standby). The main pump will be of diesel engine

driven and standby pump will be of electrical motor driven. In addition to the above two pumps, there will be an electrical motor driven jockey pump. The fire hydrants, water monitor, hoses and nozzles shall be located throughout the power plant. All the fire water pumps shall be located near raw water reservoir in cogeneration plant taking suction from the raw water reservoir. The suction for the other pumps drawing water from the raw water reservoir will be located such a way that the minimum storage of water in the reservoir will be maintained for meeting the fire water requirements.

The fire alarm system shall consist of smoke detectors, heat detectors, fire alarm panel, hooter, manual call point etc. The detectors shall be located in all the electrical panel rooms, control room and battery room. The manual call point and hooters shall be located throughout the entire TG building. The detectors will sense the fire automatically and will generate fire alarm through Fire alarm panel.

The portable fire extinguishers shall consist of dry chemical powder type, carbon-di-oxide type, foam type fire extinguishers. The extinguishers shall be located strategically inside the TG building.

2.0 Plant and Machinery (Mechanical) for Cogeneration Plant

2.1 General

2.1.1 The plant and machinery (mechanical) for the cogeneration plant shall be as follows:-

- **Steam Generating system**
- **Steam Turbines and Auxiliary System**
- **High Pressure Feed Water Heater**
- **Crane for Turbogenerator Building**
- **Fuel Handling System**
- **Ash Handling System**
- **Water system**
- **DM Water System**
- **Service And Potable Water System**
- **Compressed Air System**
- **Air Conditioning System**
- **Ventilation System**
- **Fire Protection System**
- **Main Steam, Medium Pressure and Low Pressure Steam Systems**

3.0 Plant and Machinery (Electrical) for Cogeneration Plant

- 3.1.1 The proposed new cogeneration plant at REL will generate power at 11kV voltage level which will be upgraded to 132kV level for dispersal of power to national grid. For the purpose a 132kV switchyard shall be constructed. The plant and machinery (electrical) for the cogeneration plant shall include:-

Generator

Excitation System & Synchronizing Panels

Unit Control Panel

LAVT and NGR Cubicles

11 kV Switchgear Panel

Distribution System

Plant Auxiliary Transformers and LT Panels

D.G Set for Emergency power requirement

Earthing System

Cables

DC supply system

AC Auxiliary Supply

Lighting System

Lightning Protection

Plant Communication system

Suitability of power unit to operate in parallel with grid

Generator Transformer

Circuit breakers

Protection, metering & control cubicles

Lightning Arrestors

Isolators & Insulators

Instrument transformers

Structures

Safety Earthing System for switchyard

4.0 Instrumentation and Control System

4.1 General

This Section of the Report gives the general philosophy of the Instrumentation and Control system for the new Cogeneration Power Plant.

The objectives of Instrumentation & Control system design are as follows.

- a. To ensure maximum availability of the plant
- b. To effectively monitor and control the plant to ensure desired efficiency levels.
- c. To ensure plant and personnel safety and reduce down time
- d. To provide necessary information to management personnel regarding overall plant performance
- e. To have self diagnostics & faster response time
- f. To be user friendly for operation and maintenance personnel

Centralized control and monitoring with provision for local intervention wherever necessary is the essence of the design philosophy.

Modular design concept will be adopted to ensure that single defective equipment will not disturb functioning of overall system.

The plant will be complete with the basic instrumentation and control system necessary for its safe and efficient operation.

Comprehensive instrumentation and control equipment will be provided for each major area of the plant i.e. Boilers, Turbo - generators, etc.

4.2 Design Criteria

The control system shall be based on the State-Of-The-Art Distributed Control System (DCS) technology with Data Acquisition and control of the entire plant operational parameters.

For critical automatic control loops, redundant transmitters will be provided with 2 out of 3 logic to improve reliability / availability. All other control loops shall be provided with 1 out of 2 logic.

System configuration will be such that any single point failure will not affect the continuous operation of the plant. Redundancy will be provided at appropriate levels to ensure maximum system availability.

5.0 Site Features and Plant Layout

5.1 Location and Features of the Plant Site

The proposed Cogeneration plant at REL, will be located within the premises of REL's sugar plant complex. This complex presently consists of only the sugar plant.

The following specific features of the site have been discussed in this section of the report.

- Availability of adequate space for locating the Cogeneration plant, bagasse storage and adequate space for the construction activities.
- Suitability of the site from topographical and geological considerations.
- Availability of road connections for material movements.
- Availability of adequate quantity of water for meeting the plant's water requirements.
- Availability of adequate fuel and its transport.
- Interconnection with Grid.
- Ecological Impact.

5.1.1 Space Availability

Adequate land is available within the sugar plant premises for locating the Cogeneration plant. Logistically the Cogeneration plant has to be located close to the sugar plant as the steam for the processing of sugar has to be supplied from the turbine extractions, the power for the sugar plant operations has to be supplied from the HT panels of the Cogeneration plant, and the bagasse from the sugar plant has to be supplied to the Cogeneration plant. Keeping

the plant away from the sugar plant will result in more capital cost towards the piping, cables and bagasse conveyors.

In the area identified for the Cogeneration plant, adequate space is available for the construction activities during the installation period of the plant and there will not be any hindrance to the operation of the sugar plant during the construction period. Allocation of construction space will be based on the requirements to be given by the Contractors. However, detailed topographical survey will be made during the detailed engineering stage.

5.1.2 Topographical and Geological Aspects

The area identified for the Cogeneration plant is almost flat and does not much of levelling. The level difference between the existing sugar plant and cogeneration area, if any, will be taken care of appropriately in the detailed engineering stage.

5.1.3 Rail and Road Facilities

All plant and machinery has to be transported only by road. All the imported equipment have to be brought to the port of Karachi and then transported by road. The Plant is located at Taluka Kot Digi, District Khairpur. Road connectivity to the plant is very good.

5.1.4 Water Availability

The raw water for the Cogeneration plant is required for meeting the following requirements.

- Make up water to the Steam Generator.
- Make up water to the Cooling Tower.
- Ash disposal.
- Other Plant services

The water availability is through the bore wells in the plant. Presently the requirements of the sugar mill are being met only from this bore wells.

5.1.5 Availability of Fuel

The proposed Cogeneration plant operation will be based on the in house generation of Bagasse in the sugar plant, & biomass fuels. Bagasse is generated in-house from the cane received at the sugar mill. The biomass fuels will be transported for the operation of the plant.

5.1.6 Interconnection with Grid

It is proposed to step up the generation voltage of 11 kV to 132 kV and to parallel with the National grid at 132 kV level. The 132 kV transmission lines from the Cogeneration plant's switchyard will be connected to the Electricity Transmission Company's 132 kV Sub-station at Gambat.

5.2 **Project Schedule**

5.2.1 The schedule envisages the project commissioning and synchronization in Twenty two (22) months from the date of release of advance payment to Supply Contractor. The proposed COD date will be 18 months after financial close i.e in first quarter of 2019. Civil, erection and other activities in REL's scope shall be ordered after finalisation of design.

5.2.2 For the packages in REL's scope, the schedule includes the following applicable activities.

- a) Basic Study
- b) Tendering
- c) Receipt of offers, evaluation, discussions and Purchase order placement.
- d) Construction, Erection and other work at site
- e) Commissioning, trial run and testing

5.2.3 In the proposed Cogeneration plant the boiler and the turbogenerator are the long lead items and the planning of the schedule for the project implementation should provide adequate time period for the installation of these equipment.

5.2.4 Once the project gets started, it is essential that a more detailed bar or network chart is prepared incorporating all the contract activities, so that the planning and the monitoring is effectively carried out.

6.0 Project Cost Estimate

6.1 Methodology of the EPC Cost estimate

It is assumed that the project will be executed through the package route with the Supply Contractor carrying out the Engineering, Procurement and Construction Management activities. The Supply Contractor shall make the basic design of the plant, prepares the specifications and assists REL in the finalisation of the packages. Once the packages are ordered, the Supply Contractor shall expedite with the contractors, reviews drawings, co-ordinate all the activities between the contractors and manage the implementation of the project. The complete Cogeneration plant civil works will be executed by a local contractor.

Due to the current economic conditions in most of the countries, the prices of engineering goods have not registered any appreciable increase and this probably may be the best time for capital investments. Another major advantage today is that the most of equipment suppliers do not have comfortable order book positions and consequently we can expect a shorter delivery of the equipment. While the commodity prices have come down slightly the cost of other input like energy and manpower had been continuously on the uptrend. Supply Contractor has vast experience in the implementation of these bagasse based Cogeneration projects both in India and in other countries.

6.2 Installed Project Cost

The Project Cost for the implementation of the 60 MW cogeneration plant at REL, has been estimated as US\$ 84 Million.

6.4 Arrangement of Funds

The funds shall be arranged through REL's equity and debt @ 20% and 80% respectively following the provisions provided in the Upfront Tariff determined by National Electric Power Regulatory Authority (NEPRA) for new Bagasse based Cogeneration Projects in May 2013 (modified in July, 2015).

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**Environmental
Impact
Assessment**

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**Ranipur
Energy
Pvt. Ltd.**



**Environmental
Total
Solutions**

Environmental Impact Assessment

Ranipur Energy Pvt. Ltd.
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EXECUTIVE SUMMARY

With the policy of privatization of the power industry and liberalized -schemes formulated by the Govt. of Pakistan for setting up bio mass power plant by private enterprises and in view of the Energy policy as announced by State Govt. project proponent has decided to set up 60 MW (installed capacity) bagasse based power plant at Ranipur Energy Limited, located at Ranipur, Taluka Kot Digi, District Khairpur in the province of Sindh. This report presents the findings of Initial Environment Examination (IEE) study carried out by Environmental Total Solutions (ETS) for proposed Cogeneration Power Plant.

The IEE has been prepared in compliance with the requirements of Sind Environmental Protection Act (SEPA) 2014 and Sindh Environmental Protection Agency (Review of EIA/IEE) Regulations and the project contribution to sustainable development. This project activity has excellent contribution towards sustainable development and addresses the key issues:

Environmental well-being

- Substituting the electricity requirement from grid by co-fired plant there by eliminating the generation of equivalent quantum of electricity using conventional fuel feeding the national grid.
- Conserving fossil fuel and other non-renewable natural resource.
- Mitigating the emission of GHG (CO₂).

Socio- economic well being

- Contributing to a small increase in the local employment by employing skilled and unskilled personnel for operation and maintenance of the equipment.
- Adopting an advanced and sustainable technology for long term benefits.
- Helping to bridge the gap of electricity demand and supply at local level.

Objective

The objective of the project is to satisfy the ever increasing demand for electricity in Pakistan with a clean alternative to the more fossil-fuel based electricity component of the Pakistan national grid. The project will generate 60 MW of power with 14 MW and 6.5 auxiliary for self consumption during sugar cane crushing season and off season respectively. Hence the project will export 46 MW and 53.5 MW to national grid during sugar crushing season and off season respectively.

Categorization of the project

The project would be placed in category B, Schedule I, requiring an IEE study due to:

- Low sensitivity of the micro environment in which the 60 MW power plant is being sited,
- Impact of different activities including construction, installation, commissioning and operation being confined to and localized into the microenvironment of Ranipur, Taluka Kot Digi, District Khairpur, Sindh

SUMMARY

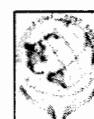
As a result of the production of this Environmental Impact Assessment Scoping Statement, the following significant potential impacts of the Renewable Energy Plant have been indicated. Other effects will also occur which will be investigated, but these are considered the most significant.

Air quality	Emissions of greenhouse gases and other emissions;
Emissions from traffic movements;	Dust levels during construction;
Flood risk	Identification of any mitigation works which may be needed during the development stage of the project;
Ecology	Direct and indirect impacts on statutory and non-statutory designated sites; Scope for biodiversity enhancements;
Transport	Increase in road movements during construction and operation; Inter-action with other proposed transport schemes;

Noise	Temporary noise increases during construction; Noise during operation;
Landscape and Visual	Visual aspects of the proposed plant; Building design;
Socio-economic	Potential for job creation during construction; Potential employment at the Renewable Energy Plant;
Energy/sustainability	Contribution to the City's sustainable energy strategy;

ABBREVIATIONS AND ACRONYMS

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CH ₄	Methane
CCGT	Combined Cycle Gas Turbine
CDM	Clean Development Mechanism
CO	Carbon monoxide
CO ₂	Carbon dioxide
DE	Decentralized Energy
DG	Distributed Generation
EBM	Environmental Base Monitoring
EMS	Environmental Management System
GHG	Greenhouse Gas (es)
GDP	Gross Domestic Product
Ha Hectare	(1 hectare = 2.47 acres)
HEP	Hydro-Electric Power
IEE	Initial Environmental Examination
NGOs	Non-Governmental Organization
NCS	National Conservation Strategy
NEAP	National Environmental Plan
NEAP-SP	National Environmental Plan Support Program
NO _x	Nitrogen oxides
O&M	Operation and Maintenance
PV	Photovoltaic
RE	Renewable Energy
SO ₂	Sulfur dioxide
T&D	Transmission and Distribution
TCD	Tones of Cane Crushed per Day
TPH	Tones per hour
UNIDO	United Nations Industrial Development Organization



TECHNICAL TERMS USED IN POWER GENERATION

Alternative fuel:

- Methanol, denatured ethanol, etc, separately or in blends of at least 10 percent by volume with gasoline or other fuels
- Compressed natural gas
- Liquefied natural gas
- Liquefied propane gas
- Hydrogen
- Coal derived liquid fuels
- Fuels other than alcohols derived from biological materials
- Electricity
- Biodiesel
- Any other fuel determined to be substantially not petroleum and yielding potential energy security benefits and substantial environmental benefits.

Background level

The average amount of a substance presents in the environment that originally referring to naturally occurring phenomena. Used in toxic substance monitoring.

Backup rate

Backup rate is a utility charge for providing occasional electricity service to replace on-site generation.

Backup electricity, backup services

Power or services needed occasionally; for example, when on-site generation equipment fails.

Baffle chamber

In incinerator design, a chamber designed to settle fly ash and coarse particulate matter by changing the direction and reducing the velocity of the combustion gases.

Bag house

A chamber containing fabric filter bags that remove particles from furnace stack exhaust gases. A bag house is used to eliminate particles greater than 20 microns in diameter

Base load capacity

The power output that generating equipment can continuously produce.

Base load demand

The minimum demand experienced by an electric utility, usually 30-40% of the utility's peak demand

Best available control measures

The most effective measure for controlling small or dispersed particulates such as soot and ash from woodstoves and open burning of brush, timber, grasslands, or trash is at sources.

Best available control technology (BACT)

That combination of production processes, methods, systems, and techniques that will result in the lowest achievable level of emissions of air pollutants from a given facility. BACT is an emission limitation that the permitting authority determines on a case-by-case basis, taking into account energy, environmental, economic and other costs of control. BACT may include fuel cleaning or treatment or innovative fuel combustion techniques.

Best management practices (BMP)

A practice or combination of practices that a designated agency determines to be the most effective, practical means of reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals

Boiler horsepower

A measure of the maximum rate of heat energy output of a steam generator. One boiler horsepower equals 33,480 Btu/hr output in steam

Boiler

Any device used to burn biomass fuel to heat water for generating steam

Bottom ash

Noncombustible ash that is left after solid fuel has been burned.

British thermal unit (BTU)

A unit of heat energy equal to the heat needed to raise the temperature of one pound of water one degree Fahrenheit at one atmosphere pressure (sea level)

Capacity Factor

The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full-power operation during the same period.

Combined Heat and Power (Cogeneration)

Combined heat and power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating power and thermal energy from a single fuel source. CHP is not a specific technology but an application of technologies to meet an energy user's needs. CHP systems achieve typical effective electric efficiencies of 50 to 80 percent — a dramatic improvement over the average efficiency of separate heat and power. Since CHP is highly efficient, it reduces traditional air pollutants and carbon dioxide, the leading greenhouse gas associated with climate change.

Emissions

Anthropogenic releases of gases to the atmosphere. In the context of global climate change, they consist of radioactively important greenhouse gases (e.g., the release of carbon dioxide during fuel combustion).

Energy Efficiency

Energy efficiency refers to products or systems using less energy to do the same or better job than conventional products or systems. Energy efficiency saves energy, saves money on utility bills, and helps protect the environment by reducing the amount of electricity that needs to be generated. When buying or replacing products or appliances for your home, look for the ENERGY STAR® label — the national symbol for energy efficiency.

Fossil Fuels

Fossil fuels are the nation's principal source of electricity. The popularity of these fuels is largely due to their low costs. Fossil fuels come in three major forms—coal, oil, and natural gas. Because fossil fuels are a finite resource and cannot be replenished once they are extracted and burned, they are not considered renewable.

Generation (Electricity)

The process of producing electric energy from other forms of energy; also, the amount of electric energy produced, expressed in watt-hours (Wh)

Generation (Gross)

The total amount of electric energy produced by the generating units at a generating station or stations, measured at the generator terminals

Generation (Net)

Gross generation less the electric energy consumed at the generating station for station's use

Grid

The layout of an electrical distribution system

Kilowatt (kW):

One thousand watts of electricity

Kilowatt-hour (kWh):

One thousand watt-hours

Megawatt (MW)

One million watts of electricity

Renewable Energy:

The term renewable energy generally refers to electricity supplied from renewable energy sources, such as wind and solar power, geothermal, hydropower, and various forms of biomass. These energy sources are considered renewable sources because they are continuously replenished on the Earth

Transmission System (Electric):

An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers, or is delivered to other electric systems

INTRODUCTION

1.1 GENERAL

Most parts of the country experience severe winter and summer conditions; as a result there is a wide variation in electricity demand during the year. Furthermore, higher share of residential sector in total electricity demand make the peak demand more pronounced. During summer and sowing seasons, the inductive load in the system increases due to tube wells, air conditioners and other motor operation while in winter, resistive load increases due to heaters. The peak load hours are generally between 6 PM to 10 PM while load decreases to its minimum between midnight

1.2 NATIONAL POLICY FOR POWER CO-GENERATION BY SUGAR INDUSTRY

The Economic Coordination Committee of the Cabinet (ECC) in its meeting held on 6 March 2013, approved 'Framework for Power Cogeneration 2013 Bagasse and Biomass' as an addendum to the Renewable Energy Policy 2006. This framework shall be effective for all high pressure cogeneration projects utilizing bagasse and biomass.

Frame Work for Power Co-Generation 2013 (Bagasse / Biomass)

- a. The Power Producer shall, under the provisions of the AEDB Act 2010. Renewable Energy Policy 2006 & this framework approach AEDB. AEDB shall act as the coordinating agency for High pressure (minimum 60 bar) bagasse / biomass based projects. The Power Producer may establish the project as part of an existing sugar mill or as a separate entity.
- b. Upfront tariff for bagasse / biomass based cogeneration projects to be determined by NEPRA.
- c. Tariff shall be on a per unit basis for energy delivered to the grid
- d. The Power Producer shall have the option to opt for upfront tariff.
- e. Power Producers shall have the option to offer energy to the respective DISCOs at 11 kv or 132 kv, or to the CPPA at 132 kV, provided that the cost of interconnection, grid station upgrades, etc. for power evacuation shall be incurred by the respective DISCOs.

- f. It shall be mandatory for the Power Purchaser to evacuate all the energy offered to it by the Power Producer, failing which such plants shall be deemed to have dispatched and sold the energy to the Power Purchaser. The CPPA shall bill the payment against such un-evacuated energy to the DISCO concerned. However, no liability shall occur to the CPPA / DISCO in case of a Force Majeure event.
- g. Standard bankable EPA & IA documents will be prepared and provided to the Power Producer by AEDB.
- h. AEDB shall issue Letter of Intent (L01) on the basis of standard proposal submitted by the project proponent.

Project Description

In order to take advantage of incentives offered by the Government of Pakistan, Ranipur Energy Pvt. Ltd. (REPL) proposed to install and operate a bagasse fired cogeneration power project at Ranipur, District Khairpur in the province of Sindh to enable export around 14 MW of power to National grid.

The Cogen project envisages installation of high pressure boiler, matching double Extraction cum condensing TG set, Condensing TG set, auxiliary equipment and all required grid paralleling / interfacing equipment.

The cogeneration project with expanded mill capacity will make optimum use of available bagasse during the season operation. During the off season operations of the power Plants, saved bagasse will be used to ensure optimum export and number of operating days. Other agro waste fuels or purchased bagasse and Rice Husk from other mills will be additional option available with Ranipur Energy Pvt. Ltd. to increase the plant operation in the off season.

Sindh is famous for its high quality rice and has a large population of rice mills. Several Process industries use rice husk as a fuel in AFBC Boiler. Rice husk is available at proposed plant area through dealers in Sindh. RER has acquired sufficient land from Ranipur Sugar Mills to store rice husk.

Project Location

The Plant site is located in Ranipur Sugar Mills (Pvt) Ltd. This is 1.5 kilometers from the town of Ranipur on main National Highway N-5. Ranipur is situated in District Khairpur, Sindh. The nearest railway station is about 4 km from site location in Ranipur city and the

nearest airport is about 75km in Sukkur. The Latitude and Longitude are 27.2878 and 68.5380 decimal degrees respectively

1.3 PROJECT OBJECTIVES

The project aims to produce electricity for supply to SEPCO through national grid thus reducing the supply and demand imbalance. The proposed power plant is a standalone power producing unit based on Bagasse fired Boilers along with T. G. Sets

The main objectives of the Project are to:

- Respond to the urgent need to close the widening gap between power generation and demand at Ranipur, District Khairpur, Sindh Ensure stable power supply to SEPCO
- Provide employment to the local people;
- Respond to the need of improvement in quality of life through sustainable power production systems.

Project Benefits

- The major benefit of this project is that it would generate many facilities in the region such as communication, employment and transport. It will also benefit the district by the development of the rural area.
- The major share of the district income is from the agriculture sector. Agriculture resources can be used for conversion into value added products.

1.4 NEED OF THE PROJECT

Currently, the country is facing a massive power crisis and to meet the increasing electricity demand, it is the need of the hour to expedite regulatory approvals, mitigate losses and pay attention for fluctuation and tripping in the power generation system:

The position with regard to availability of power has deteriorated and has compelled WAPDA to go for forced load-shedding.

Project Mission

To undertake integrated Agriculture i.e. bagasse/husk based Energy Projects through optimal utilization of locally available resources.

1.5 PROJECT OBJECTIVES

The project aims to produce electricity for supply to SEPCO through national grid thus reducing the supply and demand imbalance. The proposed power plant is a standalone power producing unit based on cogeneration fired Boilers along with T.G. Sets.

The main objectives of the Project are to:

- Ensure stable power supply to SEPCO.
- Provide employment to the local people;
- Respond to the need of improvement in quality of life through sustainable power production systems.

Project Benefits

The major benefit of this project is that it would generate many facilities in the region such as communication, employment and transport. It will also benefit the district by the development of the rural area. The major share of the district income is from the agriculture sector. Agriculture resources can be used for conversion into value added products.

Environmental Impact Assessment (IEE/EIA)

This report presents the findings of Environmental Impact Assessment (IEE/EIA) study carried out by Environmental Total Solutions (ETS) for the proposed 60 MW cogeneration bio-gas power plant being undertaken Ranipur Energy (Pvt) Limited at Ranipur, Taluka Kot Digi, District Khairpur, in the Province of Sindh.

The IEE/EIA has been prepared in compliance with the provision of Sindh Environmental Protection Act (SEPA) 2014 (Environmental Impact Assessment and environmental impact assessment). The Provisions of SEPA 2014, Part VI, section 17 Clause (1) required that:

“No proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by Federal Environmental Protection Agency or Provincial Environmental Protection Agencies, as the case may be, or, where the project is likely to cause adverse environment effects an environmental impact assessment, and has obtained from Government Agency approval in respect thereof.”

Objectives of the IEE/EIA Study

The objectives of the study is preparation of Environmental Impact Assessment Report based on the EIA notification of 1997 of Pakistan Environment Protection Agency and

requirement of concerned regulatory agencies of the State Government, incorporating the study on existing environmental conditions and various environmental issues due to proposed project.

- Assessment of the present status of air, noise, water, land, ecology and socio-economic components of the environment in the study area of the project.
- Identification, quantification, prediction and evaluation of significant impacts of the proposed project on various environmental components during the pre-project stage, construction stage and also after commissioning of the proposed project using mathematical/simulation models.
- Evaluation of the proposed waste disposal scheme for the aforementioned project.
- Identification of forestland, agricultural land, wasteland, water bodies etc. around the area
- Evaluation of the existing Environmental Management Plan (EMP) and preparation of mitigation of anticipated adverse impacts.
- Delineation of the post project environmental quality-monitoring program to be pursued by Reliance Industries Limited, as per the requirements of the EPA.

1.6 JUSTIFICATION ON REQUIREMENT OF IEE/EIA

The Pakistan Environmental Protection Agency (Review of EIA/IEE/EIA) Regulations 2000 clearly define the categories of projects requiring an Environmental Impact Assessment (IEE/EIA) or Environmental Impact Assessment (EIA) in Schedules I and II respectively.

According to Para 3 of EIA / IEE/EIA regulations-2000: "A proponent of a project falling in any category listed in Schedule I shall file an IEE/EIA with the Federal Agency, and the provisions of section 12 shall apply to such project".

According to Para 4 of EIA/IEE/EIA Regulations-2000: "A proponent of a project falling in submitting EIA/IEE/EIA in any category listed in Schedule II shall file an EIA/IEE/EIA with the Federal Agency, and the provisions of section 12 shall apply to such project". Schedule II of the regulations includes "all projects situated in environmentally sensitive areas" and "any project likely to cause an adverse environmental effect."

Power plants generating less than 200MW electricity are placed in Category B (Energy) of Schedule I (List of projects requiring of IEE/EIA). In consideration of:

- Low sensitivity of the microenvironment in which the no unit is being sited,

- Impact of different activities including construction, installation, commissioning and operation being confined to and localized into the microenvironment and
- Compliance with the above cited regulations,

The project would be placed in Category B, Schedule I, requiring an IEE/EIA study.

Accordingly an IEE/EIA study has been conducted and the report will be submitted to Sindh EPA for review and approval.

1.7 SCOPE OF THE IEE/EIA

This IEE/EIA investigates the impacts likely to arise from the different activities including construction, installation, commissioning and operation of the 60 . MW Cogeneration (Biomass) stand alone power generating unit (REPL), located at Ranipur. Taluka Kot Digi, District Khairpur, Sindh.

The IEE/EIA has been prepared to achieve the following objectives:

- Identification and investigation of likely impacts of the proposed activities during the different phases of construction, installation, commissioning and operations on the physical, biological, and socio-economic environment of the project area;
- Proposal of mitigation measures that would help the proponent in conducting the operations in an environmentally sustainable manner;
- Develop an Environmental Management Plan (EMP of effective implementation of the recommendation of the IEE/EIA.

1.8 METHODOLOGY FOR IEE/EIA

Review of Legislation and Guidelines

National Legislation, International agreements, environmental guidelines, and best industry practices were reviewed. It included previous environmental studies and environmental baselines conducted by ETS and associated consultants in the past in the project area and / or its surroundings. All data sources were carefully reviewed to collect project area's related information with regard to physical, biological and socio-economic environment

Field Data Collection

During the site visit, primary data and information on the physical, biological and socio-economic background conditions of the microenvironment and macro environment of project area was collected area specific primary information along with their views and concerns regarding the project activities.

Anticipated Environmental Impacts and Mitigation Measures

- Environmental parameters have been identified assessed and used for identification, prediction and evaluation of significant impacts.
- For impact on land and biological components of environment, the predictions have been made based on available scientific knowledge and judgment.

Recommendations to Mitigate Impacts

Keepings impacts which may arise from project related activities were identified; mitigation measures were recommended to minimize, eliminate, or compensate for the potential environmental and social impacts on the zone of influence of the Project. Mitigation measures were recommended on the basis of past experience, best industry practices, legislative requirements and professional judgment.

1.9 ENVIRONMENTAL QUALITY MONITORING IN THE STUDY AREA

Air Quality

The air quality status in the study area is assessed through a network of ambient air quality monitoring locations. The baseline studies for air environment include identification of site and project specific air pollutants prior to implementation of the project.

- Ambient Air Quality Monitoring (AAQM) was carried out at pre-identified locations. Numbers of sampling locations were selected close to the proposed project area and in the downwind direction.
- AAQM was carried out as per SEPA guidelines to determine a finer cross-sectional distribution of air pollution in an industrial developed region. The conventional air parameters viz. SO₂, NO_x, PM₁₀, PM_{2.5} was monitored.
- The concentrations have been compared with stipulated standards of NEQS (as per the National Ambient Air Quality Standards Notification,
- Micro-meteorological parameters such as wind speed, wind direction, temperature and humidity were reported including wind direction in the study area. The data were used to determine predominant meteorological conditions, characterizing baseline status and in prediction of impacts on air environment.

Noise Environment

- Noise standards have been designated for different types of land use, i.e. residential, commercial, industrial areas and silence zones, as per 'The Noise Pollution

(Regulation and Control) Rules, 2000, Notified by Ministry of Environmental protection, Government of Pakistan. The ambient noise standards and safe noise exposure limits are presented as Annexure. Different standards have been stipulated during day time (6 am to 10 pm) and night time (10 pm to 6am).

- The residential, commercial, industrial areas and silence zones close to the project site and in the study area have been identified. These locations have been chosen away from the major roads and major noise sources so as to measure ambient noise levels. Noise level measurements were carried out around the proposed plant site. Spot noise levels (A - weighted) were measured using a portable noise level meter.

Water Environment

Surface and groundwater quality has been determined and compared with Drinking Water Standards.

- The parameters of prime importance under physical, chemical (inorganic and organic), and nutrient and heavy metals category were selected.
- The water requirement and water availability in the region will be determined using secondary sources. Water balance in term of water input and output has been computed. The proposed project will have water requirement in terms of DM and cooling water only.

Land Environment

Field surveys were conducted to delineate classification of land-use pattern around the plant site.

Ecology

Flora:

- A study was carried out to study the plants in the study area through visual observation and recording the plant species as a list in the region. This list will be confirmed by the review of site literature. The data available with various agencies is referred for identifying rare or endangered species in the region.
- The ground area covered by aerial portion of the flora is called its "cover" and is used as a measure of plant's importance. The diameter of tree trunk at breast height (4.5 ft or 135 cm) is used as an expression of cover or dominance. The phytosociological data available for the study area are included in the report.

- Qualitatively, flora is assessed by delineating the type, its habitat, unique vegetative features, interrelations or associations with other community members. Plants are also observed for morphological aberrations, if any, due to pollution or any other stress. Plant species are rated visually based on its foliar cover and abundance.

Fauna:

A total of 27 birds species were recorded during the survey through direct sighting or information from locals and Wildlife experts/ staff deployed in the area. During discussions with locals and Sindh Wildlife Department's staff, it was noted that populations of certain bird's species are declining due to human's disturbances particularly due to hunting activities which affect the population of Black partridge

Socio-economic Environment

- Data on the demographic pattern, population density per hectare, educational facilities, agriculture, income, fuel, medical facilities, health status, transport, recreational and drinking water facilities were collected from secondary sources and field visits and analyzed.
- The information on industries, infrastructure facilities such as power supply, water supply, telecommunication, sewerage etc. and transportation such as roads, harbors, railway, airports and navigation were collected from secondary sources and field visits

Environmental Management Plan

- Environmental Management Plan (EMP) is drawn after identifying, predicting and evaluating the significant impacts on each component of the environment with a view to maximizing the benefits from the project. Post-project.
- Environmental Monitoring programme is also delineated in the report.
- Thus, the report has been prepared in accordance with the guidelines of EPA, Sindh as amended from time to time and with the scope of studies given in ToR issued by EPA, Sindh.

Compliance of ToR

The EIA report is prepared based on the primary data and data collected from secondary sources. The issues given in the ToR of EPA, Sindh is fully addressed and point-wise compliances are given in the report.

Reporting

In the end, all activities / steps performed during IEE/EIA study were documented in shape of IEE/EIA report; it was compiled in the format / guideline given by Pakistan Environmental Protection Agency (PEPA) in Pakistan Environmental Assessment Procedures, 1997.

1.10 ORGANIZATION OF THIS REPORT

The report is organized in following chapters;

Structure of the Audit Report

- Chapter 1 Introduction
- Chapter 2: Legislative Requirements
- Chapter 3: Environmental & Socio-economic Baseline
- Chapter 4: Technical Plant Specifications
- Chapter 5: Analysis of Alternatives
- Chapter 6: Environmental Management Plan
- Chapter 7: Conclusion

Plant Details

The plant details are as under:

General information

Name of applicant: Ranipur Energy (Pvt)Limited
Business Office: C-98, Khahkshan, Scheme-5, Block-2, Clifton, Near Ziauddin Hospital, Karachi
Cell # 0333-4217084
E mail:

Type of Generation Facility: Energy generation

Coordinates The Latitude and Longitude are 27.2878 and 68.5380 decimal degrees respectively.

Technical Details

- Gross installed capacity 60 MW
- Net Installed capacity 54 MW
- Auxiliary Consumption 6.0 MW
- Exportable Capacity to grid

(During crushing season) 46 MW

(During off season) 53.5 MW

Environmental Consultant

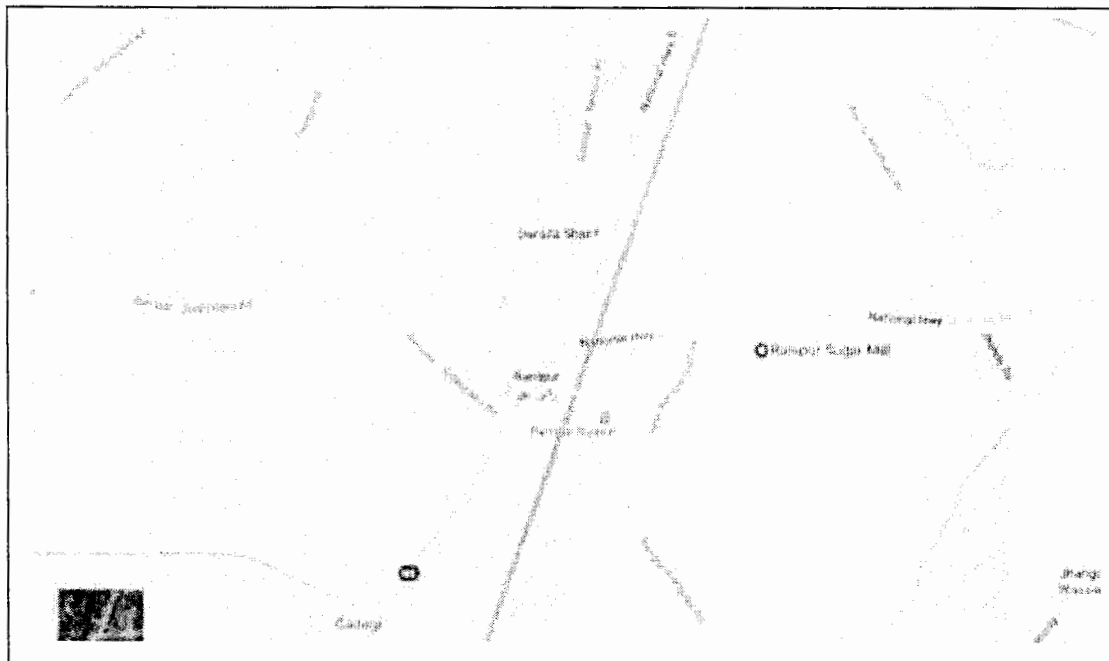
Environmental Total Solutions

Office No. 1, Aqsa Tower, Main Rashid Road, Karachi

Contact: 0333-2277350

Email: Etspk41@yahoo.com, iqbalh41@yahoo.com

LOCATION MAP OF RANIPUR ENERGY (PVT) LTD



LEGISLATIVE REQUIREMENTS

2.1 GENERAL

The principal environmental regulatory agency in Pakistan was the Environmental Protection Agency (EPA) of Pakistan that formulates environmental policies, action plans and legislation. After the 18th amendment the environmental portfolio devolved to provincial governments. Consequently, the Sindh Environmental Protection Agency (SEPA) is empowered to formulate environmental legislation, rules, regulations and standards and their enforcement/implement in the whole Sindh province as a formulating regulatory and monitoring agency. EPA Sindh's head office is located at ST-2/1, Sector-23, Korangi Industrial Area, Karachi.

Presently, the basic legislation on the environment is the Sindh Environmental Protection Act of 2014 (SEPA 2014), Sindh IEE/EIA regulations 2014 and other rules and regulations. SEPA has initiated process of notification for Sindh Environmental Quality Standards 2015 (SEQS 2015). In addition, EPA Sindh has also issued directions through print media and direct communication to the concerned parties for immediate compliance with these legislation and Rules and Regulations made so far.

This section provides synopsis of policies, legislation, and guidelines that may have relevance to the activities carried out by the Ranipur Energy (Pvt) Limited within the scope defined for this IEE/EIA. The relevant requirements of the policy documents and legislative framework have also been incorporated in the environmental management and monitoring plan being formulated for the better environmental impacts management. REL management is committed to follow and comply with the relevant requirements of the policy documents and legislative framework for the better management of environmental aspects and impacts of their business related activities

2.2 NATIONAL ENVIRONMENTAL POLICY AND GUIDELINES

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively new and ongoing phenomenon in Pakistan. The following section presents a brief overview of the existing national policies and guidelines.

National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas in order to preserve the Country's environment.

The main objectives of the strategy are conservation of natural resources, sustainable development and improved efficiency in the use and management of resources. It covers fourteen key priority areas for policy formulation and intervention, including protecting watersheds, supporting forestry and plantations, protecting water bodies and sustaining fisheries, conserving biodiversity, increasing energy efficiency, and developing renewable resources, preventing or decreasing pollution, managing urban wastes and preserving the cultural heritage. Energy policies include promoting efficiency and conservation as well as cogeneration, hydro, biogas, solar and new alternatives. The strategy also includes measures to control and limit pollution - for example, changing import duties to favor the most fuel-efficient vehicles, and regulate gasoline, kerosene and diesel pricing to make the least polluting alternatives the most affordable. Incorporation and integration of environmental and sustainable development themes into educational curricula and in the media is also an important feature of the strategy

National Environmental Policy

This policy covers all sectors and a wide range of means for promoting conservation and environmental protection in water, air and waste management, forestry, and transport. The policy aims to promote protection of the environment, the honoring of international obligations, sustainable management of resources, and economic growth. It calls for the setting of standards and regulations for ambient and indoor air quality, vehicle emissions and manufacture, energy conservation, fuel specification and building codes. It aims to promote mass transit and non-motorized transport as well as cleaner technologies, including, solar, hydroelectric, biogas and cogeneration with waste, and offering tax incentives for efficient products. It also calls for creating increased public demand for environmentally friendly products through education and mass awareness campaigns.

National Sanitation Policy

National Sanitation Policy of Pakistan provides a broad framework and policy guidelines to the Government to enhance and support sanitation coverage in the Country through the formulation of sanitation strategies, plans and programs at all respective levels for improving the quality of life of the people of Pakistan and the physical environment necessary for healthy life. The Policy will be implemented by the Federal, and Local Government Agencies in accordance with the guidelines, principles and measures spelt out in the policy.

2.3 ENVIRONMENTAL INSTITUTIONAL FRAMEWORK

Post 18th Amendment to the Constitution of Pakistan, the provincial Environmental Protection Agencies is fully empowered to initiate, modify and enforce environmental legislation in their respective provinces. In the province of Sindh, the EPA is the prime regulatory and monitoring institute. EPA is headed by a Director General (DG) who is the lead responsible person for enforcement of environmental legislation. He is also responsible for the guidance of other provincial departments/institutes on environmental matters and related issues. DG EPA Sindh functions from his registered head office located at Karachi, however, has regional offices in other major cities of the province functioning under senior officers.

EPA Sindh is attached with Environmental Protection Department (EPD) of Government of Sindh. The EPD, headed by a Secretary, is the administrative body and responsible for coordination with other line departments and agencies of the province. It also performs coordination and communication with other provinces and Federal Government Agencies.

2.4 ENVIRONMENTAL GUIDELINES

A. The Sindh Environmental Assessment EIA/ IEE Procedures 2014

In exercise of the powers conferred by Section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government of Sindh has notified the 'Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014' vide notification No. EPA/TECH/739/2014 dated 16th December 2014.

This regulation describes the procedure for conducting environmental assessments and their approval process. Categories for projects requiring IEE, EIA or Environmental Checklists is

mentioned in the regulation. The environmental assessment includes preparation of an Environmental Management Plan (EMP).

B. National Environmental Quality Standards (NEQS)

Government of Pakistan in early 1990s realized the importance of environmental pollution control by introducing National Environmental Quality Standards (NEQS) through statutory notifications as per recommendations of various advisory committees. Pakistan Environmental Protection Committee (PEPC) in its first meeting held on 10th May 1993 approved the NEQS. Later on, a set of NEQS was announced under SRO 742 (1) 93 dated 24th Aug 1993. These approved 32 parameters prescribing permissible levels of pollutants in liquid effluent while 16 parameters for gaseous emission were of uniform standards applicable to all kinds of industrial and municipal effluent. Revised NEQS were approved by the Council in December 28, 1999. These NEQS were made effective under SRO 549 (1) 2000 dated 8th August 2000.

The Council made amendments in S.R.O 742(1)/93 dated 24th August 1993 with its S.R.O. 72(KE)/2009 dated 16th May 2009.

- NEQS which were approved by the Pakistan Environment Protection Council. These NEQS for Municipal and Industrial effluent are attached.
- NEQS which were approved by the Pakistan Environment Protection Council. These NEQS for Industrial Gaseous Emissions, Motor Vehicle Exhaust, Noise and Ambient Air Quality are attached.
- NEQS which were approved by the Pakistan Environment Protection Council. These NEQS for Ambient Noise Level are attached.

After devolution of the subject of environment to the provinces (as per 18th Amendment), the Sindh EPA has initiated a process of notification of Sindh EQS. The drafts for all the said EQSs have been proposed and are in the process of approval. However, until SEQs are notified, the existing NEQS are the legal enforced standards that SEPA requires all industrial units to comply with. M/s Ranipur Energy Pvt. Ltd. would comply with the limits of SEQs relevant to the scope of this IEE/EIA, however, once SEQs are notified; the same would be substituted in this IEE/EIA.

Self-Monitoring and Reporting

In exercise of the powers conferred by section 36 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of the Government has notified the "Self-Monitoring and Reporting by Industry Rules, 2014" vide notification No. EPA/TECH/739/2014 dated 16th December 2014.

In 2014, the Government of Sindh has taken various concrete steps to attain control over industrial pollution in the Sindh Province. The most significant measure was the enactment of the Sindh Environmental Protection Act 2014, which makes it an obligation upon industrial facilities to restrict their air emissions and effluents to the limits specified in the Environmental Quality Standards (EQS).

2.5 NATIONAL ENVIRONMENTAL LEGISLATIONS

Pakistan Environmental Protection Act 1997

The Pakistan Environmental Protection Act (PEPA) was enacted on 6th December 1997, repealing the Pakistan Environmental Protection Ordinance, 1983. The PEPA' 1997 provides the framework for implementation of NCS, establishment of Provincial Sustainable Development Funds, Protection and conservation of species, conservation of renewable resources, implementation of NEQS, establishment of Environmental Tribunals and appointment of Environmental Magistrates, Initial Environmental Examination (IEE), and Environmental Impact Assessment (EIA).

Pakistan's Environmental Policy is based on participatory approach to achieving objectives of sustainable development through legally, administratively and technically sound institutions. The Federal Environment Ministry was established in Pakistan in 1975 as follow up a Stockholm declaration of 1972. The Ministry was responsible for promulgation of the environmental Protection Ordinance of Pakistan in 1983. It was the first comprehensive legislation prepared in the country. The main objective of Ordinance 1983 was to establish institutions i.e., to establish Federal and Provincial Environmental Protection Agencies and Pakistan Environmental Protection Council (PEPC). In 1993, Environmental Quality Standards (NEQS) were designed. The Act is broadly applicable to air, water, soil and noise pollution, as well as the handling of hazardous waste. Penalties have been prescribed for those who contravene the provisions of the Act. The powers of the Federal and Provincial Environmental Protection Agencies (EPAs) were also considerably enhanced under this

legislation and they have been given the power to conduct inquiries into possible breaches of environmental laws either of their own accord, or upon the registration of a complaint.

2.6 SINDH ENVIRONMENT PROTECTION ACT 2014

The Sindh Environmental Protection Act was notified by the Provincial Assembly of Sindh via notification no. PAS/Legis-B-06/2014 dated March 20, 2014. The Act extends to whole of the province of Sindh and is to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development.

Under Section 2(xxxI), the Act defines "pollution" as the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiation, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity.

The Act, under Section 17, empowers the EPA Sindh to acquire from the proponent an EIA/IEE assessment document of any project prior to commencement of any construction or operation activities. Section 19, empowers the EPA Sindh to acquire from the proponent an IEE/EIA of any project or activity so as to acquire comprehensive appraisal of the environmental aspects of that project or activity, mentioned in Sindh Environmental Protection Act 2014

Pakistan EPA Review of IEE and EIA Regulations- 2000

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations provide the necessary details on preparation, submission and review of the IEE and EIA. Categorization of projects for IEE or EIA is one of the main components of the Regulation. Projects are classified on the basis of expected degree of adverse environmental impacts. Project types listed in Schedule - II are designated as potentially less adverse effects.

Salient features of the regulations relevant to the proposed project are listed below:

Categories of projects requiring IEE and EIA are issued through two schedules attached with the Regulations. Oil and gas extraction projects including exploration, production, gathering systems, separation, and storage are included in an IEE category.

- The IEE / EIA must be prepared, to the extent practicable, in accordance with the Pak-EPA environmental Guidelines discussed in the sections to follow.
- A fee, depending on the cost of the project has been imposed for review of the IEE and EIA.
- The submitted report is to be accompanied by an application in prescribed format included as Schedule - IV of the Regulation.
- The EPA is bound to conduct a scrutiny and reply within 10-days of submittal of report (a) confirming completeness (b) asking for additional information, or (c) requiring additional studies.
- The EPA is required to make every effort to complete the review process for the IEE within 45-days, and of the EIA within 90-days, of issue of confirmation of completeness.

When EPA accords their approval subject to certain conditions, the following procedure will be followed:

- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE/ EIA.
- There is a requirement for an EMP to be submitted with the request for obtaining confirmation of compliance.
- The EPA is required to issue confirmation of compliance within 15-days or receipt of request and complete documentation.
- The IEE / EIA approval will be valid for three years from date of accord.
- A monitoring report is required to be submitted to the EPA after the completion of construction followed by annual monitoring reports during operations.

2.7 THE SINDH EPA REVIEW OF IEE AND EIA REGULATIONS 2014

In exercise of the powers conferred by Section 37 of the Sindh Environmental Protection Act, 2014, the Sindh Environmental Protection Agency, with the approval of Government of Sindh has notified the 'Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014' vide notification No. EPA/TECH/739/2014 dated 16th December 2014.

This regulation describes the procedure for conducting environmental assessments and their approval process. Categories for projects requiring IEE, EIA or Environmental Checklists is mentioned in the regulation. The environmental assessment includes preparation of an Environmental Management Plan (EMP). SEPA Review of IEE/EIA regulations 2014 is attached for ready reference and further guidance.

Other Relevant Laws

National Resettlement Policy and Ordinance

At present, the only legislation relating to land acquisition and compensation is the Land Acquisition Act (LAA) of 1894. The LAA is, however, limited to a cash compensation policy for the acquisition of land and built-up property, and damage to other assets, such as crops, trees, and infrastructure. The LAA does not consider the rehabilitation and resettlement of disrupted population and the restoration of their livelihoods.

The Asian Development Bank (ADB) came forward and provided financial and technical assistance to the GoP in 1999. The MoE and Urban Affairs then engaged consultants who prepared the Draft National Policy which still is in the draft form and has not yet passed cabinet approval.

Land Acquisition Act, 1894

The 1894 Land Acquisition Act (LAA) with its successive amendments is the main law regulating land acquisition for public purpose in Pakistan. The LAA has been variously interpreted by local governments, and some province has augmented the LAA by issuing provincial legislations. The LAA and its Implementation Rules require that following an impacts assessment/valuation effort, land and crops are compensated in cash at market rate to titled landowners and registered land tenants/users, respectively.

The LAA mandates that land valuation is to be based on the latest 3-5 years average registered land sale rates, though, in several recent cases the median rate over the past year,

or even the current rates, have been applied. Due to widespread land under-valuation by the Revenue Department, current market rates are now frequently used with an added 15 per cent Compulsory Acquisition Surcharge as provided in the LAA.

- (1) Based on the LAA, only legal owners and tenants registered with the Land Revenue Department or possessing formal lease agreements are eligible for compensation or livelihood support.
- (2) It is also noted that the LAA does not automatically mandate for specific rehabilitation / assistance provisions benefiting the poor, vulnerable groups, or severely affected PAPs, nor it automatically provides for rehabilitation of income/livelihood losses or resettlement costs. This however it is often done in many projects in form of ad hoc arrangements based on negotiations between a specific Environmental Approval (EA) and the PAPs.
- (3) Exceptions to the rule are intrinsic to the fact that the law is elastic and are broadly interpreted at provincial level depending on operational requirements, local needs, and socio-economic circumstances.
- (4) Recourse is often taken to ad hoc arrangements, agreements and understandings for resettlement in difficult situations. The above is also influenced by the fact that an amendment of the LAA has been considered necessary by the Ministry of Environment. Accordingly, a National Resettlement Policy (NRP) and a Resettlement Ordinance have been drafted to broaden LAA provisions and current practices so as to widen the scope of eligibility and tightening up loopholes (i.e. regarding definitions of malpractices, cut-off dates, political influence on routing, etc.). But both these documents are still awaiting government's approval for implementation.

The Act would apply for all the situations during the project when land area for the purpose of the project is needed to be acquired.

Affected Person Ordinance 2001

This Ordinance was promulgated in 2001 by the federal government to provide relief to persons or households affected by any Project due to loss of land or displacement. The Project under review is not affected by the provisions of this law as no displacement of population is expected to occur.

Biodiversity Action Plan

The key to protection of the biological heritage of Pakistan lies in the involvement of local people and in the support provided by competent institutions for conservation and sustainable use. The Government of Pakistan has recognized the importance of these measures in the preparation of the National Conservation Strategy and in becoming a signatory to, and ratifying, the Convention on Biological Diversity (CBD) in 1994. Developing the Biodiversity Action Plan for Pakistan, 2000 has been the most significant direct steps towards addressing the biodiversity loss.

The BAP recognizes that an EIA is used as a tool at a project level to identify environmental effects of a proposed project and to plan for reducing adverse effects. The BAP further stipulates that an EIA needs to be initiated at an early stage of project development and that public participation in the review of potential effects is important.

Canal and Drainage Act, 1873

The Canal and Drainage Act (1873) prohibits corruption or fouling of water in canals (defined to include channels, tube wells, reservoirs and watercourses), or obstruction of drainage. This Act will be applicable to the construction and O&M works to be carried out during the proposed Project.

The Sindh Irrigation Act 1879

This Act empowers the GoS to use the natural sources of water such as lakes, rivers, and streams, for supply of water for irrigation and other purposes. It allows the government to develop the required infrastructure, for example, canals, channels, pipelines, for the supply of water. It also allows the government to charge fee for the supply of water and regulate the water supply. The Irrigation Department of the Government of Sindh is the concerned department to which the project proponents have to apply to seek permit to obtain water from Indus River. The irrigation department will also charge fee as per the prevalent rates.

Employment of child Act, 1991

Article 11 (3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows child labor in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth year of age. The ECA states that no child shall be employed or permitted to work in any of the

occupations set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out. The processes defined in the Act include carpet weaving, bidi (kind of a cigarette) making, cement manufacturing, textile, construction and others. REL and its contractors will be bound by the ECA to disallow any child labor at the Project sites or campsites.

Cutting of Trees Act, 1975 & Protection of Trees & Bush Wood Act, 1949

The Cutting of Trees Act prohibits cutting or chopping of trees without prior permission of the Forest Department. Section 3 of this Act states "No person shall, without the prior written approval of the local formation commander or an officer authorized by him in this behalf, cut fell or damage or cause to cut, fell or damage any tree."

Similarly, the Protection of Trees and Bush wood Act, 1949 prohibits cutting of trees and bush wood without permission of the Forest Department. The Act was enforced to prevent unlawful removal /clearing of trees and green areas for any reason without the consent of the Forest Department.

Sindh Wildlife Protection Ordinance, 1972

The Sindh Wildlife Protection Ordinance was approved in pursuance of the Martial Law Proclamation of 25th March, 1969. Under this Ordinance, three types of protected areas viz. National Park, Wildlife Sanctuary and Game Reserve have been notified for protection, conservation, preservation and management of wildlife.

This law declares any such area and its wildlife the sole property of the Government, making it accessible only to public for recreation, education and research. No hunting, shooting, trapping or killing is allowed without obtaining a special permit to do so within specific conditions and time limitations.

Antiquities Act, 1975

The Antiquities Act relates to the protection, preservation and conservation of archaeological/historical sites and monuments.

The Sindh Cultural Heritage (Preservation) Act, 1994

This provincial Act empowers the Government of Sindh (GoS) to preserve and protect any premises or objects of archaeological, architectural, historical, cultural, or national interest in Sindh by declaring them protected.

Among various provisions of this act some are, formation of an Advisory Committee to government to overlook and subsequent right of Acquisition of a protected heritage of architectural, historical, archaeological or national value, custodian/guardianship rights for preservation and declaration of protected heritage, evaluation of ownership rights, take legal action against any offender who attempts to damage, destroy, remove, deface, alter or imperil the protected heritage or to build on or near the site. It also details the purchase, maintenance and repair works of a protected heritage under the government's jurisdiction. The advisory committee may also receive voluntary donations towards the cost of maintenance of a protected heritage site. The act also establishes the right of access to certain protected heritage sites, penalties for violators, formulation of rules and provides protection to the persons working under this Act.

Sindh Local Government Ordinances, 2001

These ordinances issued following the devolution process, establish regulations for land use, the conservation of natural vegetation, air, water, and land pollution, the disposal of solid waste and wastewater effluents as well as matters related to public health and safety.

Forest Act, 1927

This Act provides rules and regulations for the protection of forests, control of timber and other forest-produce transit, village forest and social forestry. The Act is being revised as the law was framed for regulating forests all over India. It was adopted as it is after the creation of Pakistan and it continues to remain in force till to date without assessing whether it fulfills present day's requirements or not.

This act has been comprehensively formed and specifies concerned agency the power to declare protected and reserved forests by government notification, powers entitled to forest settlement officers, power to acquire land over which right was claimed, powers to stop ways and water-courses in reserved forests, healing of claims relating to shifting cultivation, power to issue and publish notification to reserve trees, power to make rules for protected forests, power to declare forest no longer reserved, order on rights of pasture or transit forest-produce, record keeping by the forest settlement officer, commutation of right to appeal, time limit for resolution of claims and appeals, notification of acts prohibited in such forests (unlawful cutting of trees), awarding penalties on violations.

National Forest Policy, 2001

The National Forest Policy deals with the Renewable Natural Resources (RNR) of Pakistan such as forests, watersheds, rangelands, wildlife, biodiversity and their habitats with the aim to eliminate the causes of depletion to such resources through the active participation of various concerned stakeholders and government departments.

Some of the main elements of this policy include reducing the impact of socio-economic causes such as population planning, providing substitutes to firewood, poverty alleviation, reducing political interference in the forest and wildlife departments, renovating and invigorating institutions of RNR (local governments i.e. districts), policies for fragile ecosystems (mountain forests, mangroves), development of rain forests, maintaining irrigated plantations, preservation of unique forests, protection of wildlife, rangelands and desert ecosystems, planting of trees and fodders on farmlands and general monitoring and evaluation schemes.

2.8 NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA) ACT 1997

The NEPRA Act was approved by Parliament and signed into law in December 1997. It seeks to create an autonomous, independent regulatory authority, which will be solely responsible for the power sector. It will be responsible for the oversight of the power sector and will exercise control through its power to license power generation, transmission and distribution. It will regulate tariffs for all these activities. It will perform its functions through transparent processes to be enshrined in rules that are being framed in a transparent manner through appropriate rules.

Power Policy 1998

The revised power policy was implemented in 1998. The objective and intentions of the Government of Pakistan (GOP) to new policy is to move towards the creation of a competitive power market in Pakistan. It proposes to do so by restructuring and privatizing the existing thermal power generation, the power transmission and distribution functions and assets of existing public sector utilities (WAPDA/K-Electric), by the creation of a fully autonomous regulatory authority, the National Electric Power Regulatory Authority (NEPRA), and through its future IPP policy. The salient features of the Policy are;

- The basis for selection of private power project will be minimum level-zed tariff through International Competitive Bidding. Variable tariffs over the life of the project

will be permitted under terms specified prior to bidding. The process of selection will involve pre-qualification, issuance of a Request for Reports (RFP), bidding and evaluation of bids against bid criteria clearly laid out in the RFP.

- It is recognized that without a proper feasibility study for a particular site specific hydel or indigenous coal based project, it will not be possible to invite competitive bids and receive firm offers. Thus, detailed feasibility studies for such projects will be prepared before bids are invited.
- Hydel projects will be implemented on a Build Own Operate Transfer (BOOT) basis; to be transferred to the province in which it is situated at the end of the concession period, and thermal projects on a Build Own Operate (BOO) basis.
- Competitive Tariffs will comprise an Energy Purchase price and a Capacity Purchase Price with adequate provisions for escalation.

2.9 INTERNATIONAL GUIDELINES AND TREATIES/CONVENTIONS

World Bank Guidelines on Environment

The principal World Bank publications that contain environmental guidelines are listed below.

- Environmental Assessment-Operational Policy 4.01. Washington, DC, USA. World Bank 1999
- Pollution Prevention and Abatement Handbook: Towards Cleaner Production, Environment Department, the World Bank, United Nations Industrial Development Organization and the United Nations Environment Program, 1998
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139, Environment Department, the World Bank, 1991
- Environmental Assessment Sourcebook, Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects. World Bank Technical Paper No. 154, Environment Department, the World Bank, 1991

The first two publications listed here provide general guidelines for the conduct of an IEE/EIA, and address the IEE/EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed for the Bank projects, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains enormous information which is useful to environmentalists and project proponents.

International Convention on Biodiversity

The International Convention on biodiversity was adopted during the Earth Summit of 1992 at Rio de Janeiro. The Convention requires parties to develop national plans for the conservation and sustainable use of biodiversity and to integrate these plans into national development programs and policies. Parties are also required to identify components of biodiversity that are important for conservation, and to develop systems to monitor the use of such components with a view to promoting their sustainable use.

Environment Related Relevant International Agreements in Pakistan's context

Pakistan is a party to the following treaties and agreements in furtherance of its environmental goals and programme.

Treaty	Pakistan Status
Convention on the Protection of Ozone Layer on Dec 18, 1992	Signed
The Amendment to Montreal Protocol on Substance that depleting Ozone layer	Signed
UN Framework Convention on Climate Change on June 13, 1992	Signed
Convention on the Continental Shelf on October 31, 1958	Signed
The Convention on High Seas on October 31, 1958	Signed
The UN Convention on Law of the Sea on December 10, 1982	Signed
The Convention on Territorial Sea and the Contagious Zone and the Agreement for the establishment of Network of Aquaculture Centers in Asia and the Pacific	Signed
The Convention on Wetlands of the International Importance on July 23, 1976	Signed
The Convention on protection of the World Cultural and Natural Heritage on July 23, 1976	Signed
The Convention on International Trade in Endangers Spice of Wild Fauna and Flora	Signed
The Convention on Conservation of Migratory Species of Wild Animal on Dec 01, 1987	Signed
The Convention on Biological Diversity in 1994 and became party to the CBD, Convention duly recognizes the intrinsic value of biological diversity, genetic, social, economic, cultural,	Signed

educationist, recreational and esthetic values of biodiversity and its components	
The International Plant Protection Convention.	Signed
The Plant Protection Agreement for Area & pacific region	Signed
The Agreement for the establishment of a convention for controlling the desert lost in eastern region of its Distribution Area in South East Asia	Signed
The Treaty Banning Nuclear Weapon Test in the Atmosphere, in Outer Space and under Water on March 3, 1988	Signed
The International Convention on Oil Pollution Preparedness Response and Corporation	Signed
The Convention on prohibition of Military or any other Hostile Use of Environmental Modification Techniques and Accession of Feb 27, 1986	Signed
Pakistan became a party to Montreal Protocol by Ratifying the protocol and its London amendment on Dec 18, 1982.the subsequent amendments known as Copenhagen Amendment which, accelerate the phase out for rectified in Jan 1995.	Signed
Convention of International trade En-dangerous Species (CITS)	Signed
World heritage Convention Ramsar Convention	Signed
United Nation Convention to Combat Ozone depletion (CCD). The convention signed and ratified in 1996	Signed
Stockholm Convention for Phasing out Parenting Organic pollutants (POPs) in 2001	Signed

Applicable International Environmental and Occupational Safety and Health Laws and Regulations

International and National Non-Governmental Organizations

International and National Non-Government Organizations (NGOs), such as the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wide Fund for Nature (WWF), have been active in Pakistan for some time. Both of these NGOs have worked closely with the Governments at the Federal as well as Provincial levels and have positively contributed to the cause of environment. They have played significant role with regard to the formulation of environmental and conservation policies.



And last but not the least, another the most prominent NGO namely "Sustainable Development Policy Institute" (SDPI) has also played very significant role in upholding the cause of environmental protection in Pakistan. Environmental NGOs have been particularly active in the advocacy for promoting sustainable development approaches. Most of the government's environmental and conservation policies, even at the provincial and federal levels, have been formulated in consultation with these leading NGOs, who have also been involved in drafting new legislation on conservation.



ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

3.1 GENERAL

This chapter defines the prevailing environmental and socioeconomic settings of the project area and its surroundings. The project area in this document is defined as 'the area where the project related activities to be carried out which include the proposed project site and surroundings and the area that can interact with the project's positive and negative externalities in the long run'. The environmental impact of any activity or process will be assessed on the basis of a deviation from the baseline or normal situation. Followings are the main components of the baseline:

- Physical Environment
- Biological Environment
- Socioeconomic Environment

The information presented in this section has been derived by a combination of desk study and field survey. Field survey was conducted to collate primary data for air, water, flora, fauna, noise and socio-economic features. A team consisting of Environmentalist, Sociologist, and Ecologist and Wildlife experts visited the project area. The description provided in this section is based on following:

- Desktop study and literature review
- Baseline data gathered from field activities
- Baseline data from relevant departments
- Government released publications such as Provincial and Federal census reports.

3.2 PHYSICAL ENVIRONMENT

Physical Features/Characteristics

The proposed project activities will be carried out within the Digi Taluka of the Khairpur Districts respectively.

Geologically major portion of Khairpur is formed of sedimentary & volcanic rocks of quaternary type while a tiny portion in the north is of tertiary type (*Atlas of Pakistan*). Khairpur can be divided into three broader zones. The area lying in the vicinity of River Indus is part of Indus's active flood plain. Next to this is the area irrigated by a network of canals. Four main canals pass through the district including Khairpur West, Rohri, Khairpur East and Nara canals.

This zone is part of Indus's old flood plain, is quite fertile and remains under year long cultivation. Major area of the district is under the desert zone called Nara (Piedmont plains) that makes part of the eastern desert zone of Pakistan. It is placed between Cholistan in Punjab and Thar in Sindh.

The north-western part of Nara is composed of a series of low lying hills/ridges (100 m high) of limestone that run for 45 km from north east to south east. An old flood course or branch of River Indus called Nara passes through the western portion of the desert zone. It was turned to a perennial canal taken out from Guddu Barrage. The areas adjacent to Nara canal watered by lift irrigation is quite fertile and presents a scene of an oasis in the vast desert composed of sand dunes of considerable height. The soils of Khairpur can be divided into four broader types:

1. Loamy and some stratified soils of young flood plains,
2. Loamy and clayey soils of older river plains,
3. Rocky outcrops with very patchy cover of heterogeneous soil material of the western mountainous region,
4. Rolling to hilly sandy soils of aeolian deserts.

In terms of natural vegetation, tropical thorn (or rakh) is found in the active and old flood plain of Indus while desert (desertic and semi-desertic) vegetation is found in the Nara zone. Climatically Khairpur is hot and arid and receives a very little average annual rainfall. In terms of rainfall, the district can be divided into two zones. The North western zone receives an average annual rainfall from 125-255 mm whereas the south western zone is drier receiving, on average, less than 125 mm annual rainfall. January is the coolest month when the mean minimum temperature may fall to 7°C while May and June are the hottest months when the mean maximum temperature may rise to 45°C.

In terms of land use, major portion of the district can be termed rough grazing land followed by lands/areas that are devoid of any vegetation cover. The northwestern portion of the district is under arable agriculture while a very small portion of the district has a forest cover.

3.3 SEISMICITY

Pakistan is located in the Indus-Tsangpo Suture Zone, which is roughly 200 km north of the Himalaya Front and is defined by an exposed ophiolite chain along its southern margin. This region has the highest rates of seismicity and largest earthquakes in the Himalaya region, caused mainly by movement on thrust faults. Figure 5.4 shows the location of Seismic Monitoring Station of Pakistan Meteorological Department (PMD). From figure it could be seen that there is no PMD seismic station available in the project area.

According to seismic zones of Pakistan developed by Geological Center Quetta, the project area falls under category 2A of minor to moderate damage seismic activity. As per last year seismicity report issued by Pakistan Meteorological Department frequency of earthquake in project area and its surrounding is very low.

3.4 WATER RESOURCES

Surface Water

There is no natural surface water resource in the project area. The Nara Canal, located at 20-30 km west of Kadanwari block, brings water from the Indus River and irrigates parts of the agriculture land located in the western portion of Kadanwari Block. Other nearest surface water resources includes Reni Canal and irrigation network which comprise of Tail end Ghotki's canal's branches located at a distance of approx 50-60 km in the northern direction of the project area.

The availability of irrigation water is not ensured at the tail end and cultivation of farms in the area is consequently erratic. The water within Reni Canal (which is a drainage channel) is highly saline.

Ground water

The project area predominantly comprise of sand dunes. This part of desert area, owing to low rainfalls, high runoff potential and high evaporation rates; has limited supply of fresh groundwater. In the desert; thin fresh water lenses and perched. Fresh water aquifers are the

only source of water supply. Precipitation being low in the area does not significantly affect the water table. It only benefits the desert dwellers, where rainwater on a limited scale temporarily fills the Tars or Tals and recharges the dug wells, only to sustain their demands for a few months. The people of deserts are largely dependent on the period for which this supply of water lasts. Water is extracted through hand pumps or tars (open wells excavated in low lying depressions). The water table of project area lies at a depth of about 80 to 100 feet. The only source of water for human beings and livestock is derived from dugout/natural ponds, in which the water is stored during monsoon season.

Water quality

Water quality analysis was carried out in the project area as part of the IEE/EIA study. For this purpose, 4 water samples were taken from various sources being used by residents for different purposes. These sources include, tank water, well water, ground water and surface water. Around 27 parameters were analyzed in each sample and thereafter compared with Sindh Standards for Drinking Water Quality. All these parameters of water play an important role, especially in determining its quality and suitability for particular applications. At present, sources of water contamination are very common, mainly caused by disposal of domestic and livestock wastes by local communities. Analysis of some criteria pollutants including heavy metals was conducted to determine their extent in water samples.

3.5 CLIMATOLOGY AND METEOROLOGY

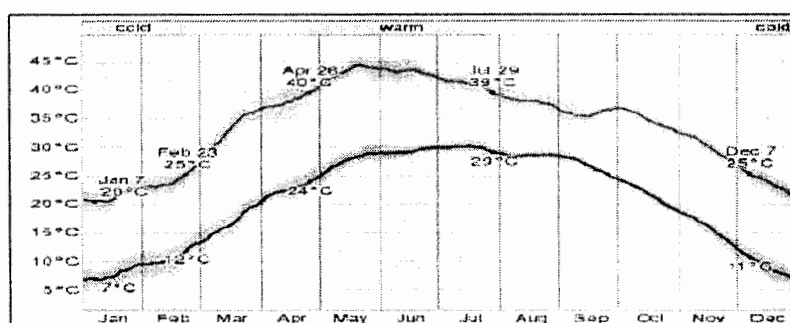
Sindh is divided into three climatic regions: Siro (the upper region, centred on Jacobabad), Wicholo (the middle region, centred on Hyderabad), and Lar (the lower region, centered on Karachi). The thermal equator passes through upper Sindh, where the air is generally very dry. Central Sindh's temperatures are generally lower than those of upper Sindh but higher than those of lower Sindh. Dry hot days and cool nights are typical during the summer. The climate of project area is typically of the upper Sindh region. There are two well defined seasons, hot and cold. The former begins at the end of March and extends till October. May, June and July are the hottest months. The mean maximum and minimum temperatures during this period are about 42 °C and 27 °C, respectively.

December, January and February are the coldest months. The mean maximum and minimum temperatures during this period are about 25 °C and 7 °C, respectively. The generally estimated average annual rainfall in the area is 5.47 inches (139 mm). Observatory record of

the Pakistan Meteorological Department (PMD) at Sukkur has been used as a data for whole project area because no metrological station is located in project area.

Over the course of last five year, the temperature near project area typically varied from 7°C to 44°C and is rarely below 5°C or above 46°C. The warm season lasted from April 26 to July 29 with an average daily high temperature above 40°C. The hottest day of the year is May 21, with an average high of 44°C and low of 28°C. The cold season lasted from December 7 to February 23 with an average daily high temperature below 25°C. The coldest day of the year is January 1, with an average low of 7°C and high of 21°C. Minimum and Maximum averages for low (blue) and high (red) temperature with percentile bands for last five year are shown in Figure .

Figure 3.1: Maximum & Minimum Temperature during Last Five Years

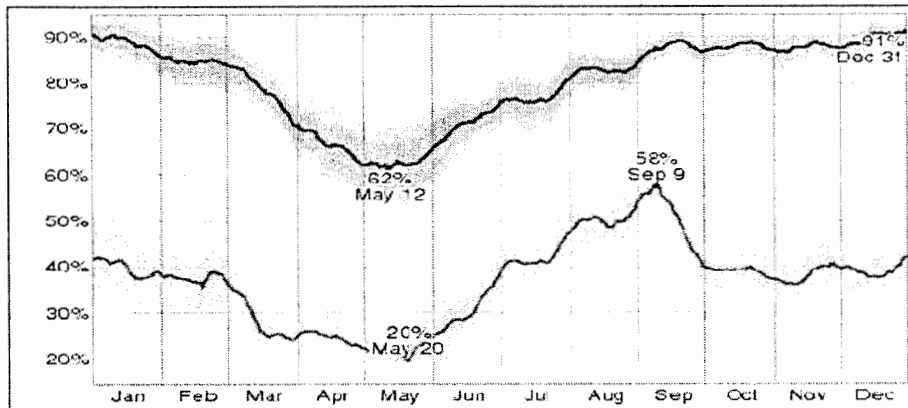


Humidity is an important factor in determining how weather conditions feel to a person experiencing them. Hot and humid days feel even hotter than hot and dry days because the high level of water content in humid air discourages the evaporation of sweat from a person's skin. The daily minimum humidity is more relevant for understanding daytime comfort than the daily maximum humidity which typically occurs during the night.

The relative humidity typically ranges from 20% (dry) to 91% (very humid) over the course of the year, rarely dropping below 15% (very dry), or exceeding 95% (very humid). The air is driest around May 20, at which time the relative humidity drops below 23% (dry) three days out of four; it is most humid around December 31, exceeding 89% (very humid) three days out of four.

The average daily high (blue) and low (brown) relative humidity with percentile bands for last five year are shown in figure.

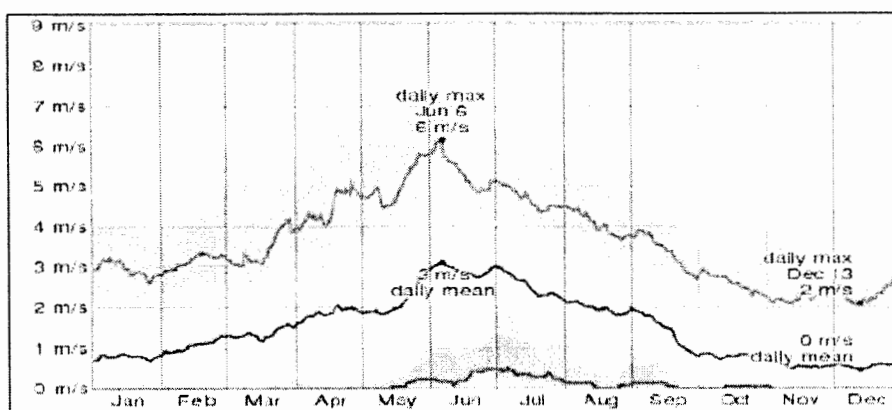
Figure 3.2: Minimum & Maximum Relative Humidity during Last Five Years



Project Area is characterized by high wind velocity, massive shifting and rolling of sand dunes; high diurnal variation of temperature; scanty rainfall; extreme solar radiation and high rate of evapo-transpiration. Over the course of previous five year for Khairpur; typical wind speeds vary from 0 m/s to 6 m/s (calm to moderate breeze), rarely exceeding 8 m/s (fresh breeze). The highest average wind speed of 3 m/s (light breeze) occurs around June 6, at which time the average daily maximum wind speed is 6 m/s (moderate breeze). The lowest average wind speed of 0 m/s (light air) occurs around December 13, at which time the average daily maximum wind speed is 2 m/s (light breeze).

The wind is most often out of the north east (11% of the time) and south east (11% of the time). The wind is least often out of the west (1% of the time), north (1% of the time), north west (3% of the time), east (3% of the time), and south west (4% of the time). The average daily minimum (red), maximum (green), and average (black) wind speed with percentile bands for last five year are shown in figure.

Figure 3.3: Wind Speed (M/S) during Last Five Years



3.6 AMBIENT AIR & NOISE

In the absence of acute industrial units and mobile vehicular traffic there is no brown pollution exists in the project corridor. The air quality in the area is generally good, with negligible sources of pollution like emissions from vehicular traffic causes smoke and dust emissions whose effect is localized.

Overall Air monitoring indicates that average concentrations of CO, NO₂ and SO₂ were found below the permissible limits regulated by SEQS, 2014 for ambient air. Environment have been described on the basis of secondary data

3.7 BIOLOGICAL ENVIRONMENT

In this section, the baseline environmental conditions pertaining to biological environment have been described on the basis of primary and the secondary data. The faunal field data collection included line transects, incidental sightings and plot searches for birds, reptiles and mammals. The vegetation surveys were carried out by laying 30ft by 30 ft quadrates within the study area.

Floral Habitat Types

Based on the physical features and vegetation attributes in the proposed project area, five distinct habitats were identified as:

- Crest (Top of the sand dune);
- Slopes/swale/flanks;
- Sandy plains (Tar-Tarai- low lying flat areas);
- Saline/sodic Land.
- Lake/wetland habitat and

Crest Habitat

Sand dunes are the main characteristic features of the study area. Topography of this habitat varies from undulating to moderately steep, whereas elevation of the dunes is from 10 to 30 meters. These sand dunes are very excessively drained. Most of the area is barren and only 15 plant species (10.34%) are recorded from this habitat type. These plants can be regarded as sand loving plants and they have the capability to survive over there. The floristic composition of this habitat include:

Calligonum polygonoides, *Aerva javanica*, *Dipterygium glaucum*, *Limeum indicum*, *Indigofera argentea*, *Tribulus longipetalus*, *Aristida adscensionis*, *A. funiculata*, *Panicum turgidum*, *Lasiurus indicus*, *Stipagrostis plumosa*, *Cyperus arenarius* and *C. conglomeratus*.

Lake/wetland habitat:

This habitat is established on both the banks of the Nara canal due to the seepage from canal. The rise of water in Wetland (locally called Dhand) solely depends up the water availability in Nara Canal, which lies in the same topographical region. There were 26 species (17.93%) growing in this habitat.

The edges of lakes are dominated with under story plant community like *Saccharum bengalense*, *S. spontaneum* and *Tamarix passernioides*. Besides, *Aeluropus lagopoides*, *Cynodon dactylon*, *Desmostachya bipinnata* and *Phragmites karka* are forming common vegetation in this habitat. These plants typify emergent vegetation, which has its roots in soil covered or saturated with water and its leaves held above water. Nearly 40 lakes of varying sizes were reported from Nara desert

3.8 FLORAL ATTRIBUTES OF THE PROJECT AREA

This section provides information regarding natural vegetation of the proposed project area that falls in the Nara desert. The area is characterized by low rainfall, high summer temperatures, high velocity winds, poor soil and low diversity of plant species. This type of climatic conditions hardly supports any appreciable vegetation. Hence, the vegetation is sparse and mainly consists of stunted or thorny shrubs and perennial herbs capable to sustain harsh climatic conditions in both the seasons. Ephemeral vegetation appears during rainy season, completing their life cycle before summer approaches.

Around 46 species of plants were reported from Kadanwari with almost all known for ethno botanic use and the vegetation pattern followed the same pattern as of Nara, however, with a lesser intensity. Whereas; Out of 46 reported species current checklist identified the presence of some 21 species in Kadanwari Block. Hence the current survey noticed a marked decline on the pressure on natural resources of the area. Illustrate summary of previously reported and current existence of

3.9 FAUNAL ATTRIBUTES OF THE PROJECT AREA

The field data were collected in early May, 2016. As many as 14 species of mammals, 27 species of birds and 12 species of reptiles were recorded from the sampling localities in the Project area. The summary of observations made during study is summarized below:

Birds

During the field visit, 27 species of birds were recorded from the sampling localities. As the surveys were conducted in summer, hence no influx of migratory birds was noted. Neither Houbara Bustard nor migratory water birds were recorded in project area, the major wetland that is Baboo Dhand supported only Blackwinged stilts a resident species. Among birds the common species included the Black Crowned Finch Lark, Black Drongo, Bank Myna, Little Brown Dove, Ring Dove, Common Myna, Crested Lark, Green Bee-eater, House Crow, House Sparrow, Purple Sunbird, Red wattled Lap wing, Sindh Sparrow and White Cheeked Bulbul.

The less common species recorded were Black Kite, Black Winged Kite, Bay backed shrike, Blue Rock Pigeon, Common Babbler, Common Kestrel, Desert Lark, Southern Grey Shrike, Grey Partridge, Indian Robin, Indian Roller, Long tailed Grass Warbler and Pied Bush cat. Southern Grey Shrike was recorded as summer breeding visitor common Kestrel which is a winter visitor was recorded as scarce in the project area.

Mammals

Around 14 species of mammals were recorded from the sampling localities in the project area. These include large colonies of little Indian field mouse. Five-striped Squirrels were recorded from areas with tree cover in tarai areas, as these are mainly arboreal species. Similarly, the Indian/Desert Hare was recorded close to bushy vegetation, as they need cover for their survival from predators and raptors during day time. House Mouse and House Rat were present close to human settlements. The abundance of rodents and small mammals supports the carnivore population in the Project area. These include Asiatic Jackal, Indian Desert Cat, Indian/Bengal Fox and Common Red Fox. Presence of Chinkara could not be confirmed from direct and indirect observations.

Among large and medium sized Mammals, Asiatic Jackal, Red Fox, Crested Porcupine, India Fox, Indian Desert Cat and Small Indian Mongoose were recorded, while in small mammals, Indian Gerbil, Baluchistan Gerbil, Long eared Desert Hedgehog, Indian Hare, House Rat, House Mouse, Indian Desert Jird and Northern Palm Squirrel were recorded.

Reptiles

The desert provides a favourable habitat for many reptile species especially the Indian sand swimmer, Indian fringe toed sand lizard and Desert monitor. The desert monitor and Indian spiny tailed lizard inhabit mostly the desert areas while the Indian monitor was found in areas close wetlands. The important snakes recorded from the project area are Saw-scaled viper, Glossy bellied racer, Indian sand boa and Pakistan ribbon snake. Except for Saw scaled viper, other three non-poisonous snakes are protected under the SWPO.

A total of 12 reptiles species, have been recorded from the Project area. The desert provides as favorable habitat for many reptile species such as Indian Sand Swimmer, Indian Fringe Toed Sand Lizard, Desert Monitor and Indian Spiny Tailed Lizard. The important snakes recorded from the Project area are Saw-Scaled viper, Glossy Bellied Racer, Indian Sand Boa and Pakistan Ribbon Snake. Out of Total 12 recorded species, the Desert Monitor is protected under the Sindh Wildlife Protection Ordinance, whereas none is on IUCN Red List. Out of Total 12 reptiles, three are on CITES appendices showing their international importance because of their significant Trade.

The sand dunes and other sandy area are habitat of Indian sand swimmer, Indian Desert Monitor, Indian Sand Boa and Saw Scaled Viper. The abandoned burrows of rodents are often occupied by the snakes and lizards. The inter-dunal flat areas (Tar) and Tarai are habitat for Indian Spiny Tailed Lizard. Brilliant Agama and Sindh Sand Gecko were also recorded from Project area site but in very less numbers.

Socioeconomic Development

Demography

According to population estimates for 2009, 20, 96,000 people are the residents of this district. From 1998 to 2009, an increase of 36% has been recorded, meaning the population has been growing with an annual growth rate of 2.8% during last 11 years. For the inter census period of 1981-1998, the population was recorded to have been growing with an average annual growth rate of 2.71%. Since 1981 there has been a 114% increase in the total population of the district.

In terms of population balance, there were 109 males against every 100 females. The balance further disturbed witnessing 110 males against every 100 females in 1998, while the estimates for 2009 suggest that male-female ratio is currently 110.1. Khairpur is the second

most populous district of Sindh following Karachi and contains 5% population of the province.

However being a vast district, the population density in Khairpur is not very high i.e. 132 person/sq.km. This figure appears to be very small due to the desert zone which covers 3/4 area of the district. In 1998 the Khairpur Taluk being the most densely populated taluka of the district had a population density of 493.4 persons/sq.km compared to only 8 persons/sq.km in Nara taluka.

Since 1951, the time of first population census in Pakistan, there has been a 500% increase in the population density. The major portion of district's population resides in the north western zone divided into 7 talukas. Here the population density was recorded to be 338 persons/sq.km.

Khairpur is urbanizing at a faster pace while 3/4th of the population residing in the rural areas. In 1951 only 6% population of the district was living in the urban settlements. This proportion was recorded to have reached 24% in 1998. Khairpur, the district headquarter town is the major urban settlement where more than 100,000 people were found to have been living at the time of census 1998.

All the 17 major towns or urban settlements of the district fall in 7 western Talukas of the district. The important ancient town of Kot Diji, having a history believed to be older than Mohan jo Daro, is one of these urban settlements. Except the Khairpur city, all the other urban settlements are small to medium sized towns.

Housing

Khairpur has witnessed considerable improvement in terms of housing stock and services since 1998 especially in the urban areas where the improvement appears to be much more when compared to the rural housing stock. In 1998, 76% rural houses had roofs made of wood/bamboo. The proportion reduced to 68% in 2006-07. The figures for urban houses in this regard were 56% and 28% for the same periods. Similarly 17% rural houses were made of pacca walls in 1998. The figure improved to 31% in 2006-07. The figures for urban housing were recorded to be 41% and 65% respectively for the same survey years.

Electricity was available to 62% rural and 80% urban houses in 1998. In 2006-07 the figures improved to 96% and 65% respectively.

The household sanitary conditions in terms of availability of latrine inside the house appears to be much better compared to other districts under study. No urban and 5% rural houses are without latrine facility of any kind. 3/4th of the rural households compared to 1/4th urban ones have non flush latrine facility. When it comes to the availability of flush latrine, Khairpur has 8th rank out of 16 districts of Sindh. In 2004-05, this rank was noted to be 15, meaning considerable improvement in the household sanitary conditions.

Majority of both rural and urban housing units are composed of 2-4 rooms. Hand pump is the major source of water for the household consumption. In recent years, a large number of urban households have installed motor pumps for the sake of convenience. In rural areas the motor pumps have yet not made an inroad in a considerable way. Interestingly a larger proportion of rural households compared to urban ones were noted to have been connected with a piped water supply. In terms of availability of piped water supply Khairpur has 11th rank out of 16 ndistricts of Sindh. This rank, was noted to be 15, in 2004-05.

Despite being rich in reserves of natural gas, this cleaner fuel option is not available to majority of households in Khairpur. 96% rural and 48% urban households continue to resort on biomass fuels especially wood to fulfill their household fuel needs

Education and Literacy

Like other socioeconomic development sectors, Khairpur appears, in the light of official development statistics, to have made progress in the field of education and literacy too. During last one decade, the literacy figure among the population aged 10 and above has improved from 35.5% to 46%. In 1998, 50% males and 20% females (aged 10+) were literate. The figures improved to 65% for males and 25% for females. Khairpur has second highest number of government primary schools following Tharparkar and second highest primary school enrollment after Karachi, in the Sindh Province. The district has 6th and 7th ranks when it is compared to the proportion of literacy among population aged 10+ and aged 15+, respectively in other districts of Sindh.

Government schools have an important place when it comes to providing education facilities to people of Khairpur. 9 out of 10, primary school attending students go to government schools. The education sector in Khairpur, like rest of the country is marred with a number of grave issues.

Some of them are:

1. The level of literacy is not satisfactory. Compared to 46% population that is considered to be literate, 38% population has completed primary or higher levels of formal education.
2. There exist stark gender, urban rural and intra district disparities in the district. 25% females compared to 65% males, and 17% rural compared to 47% urban females are literate. Only 12% rural women have completed primary or higher levels of education compared to 38% urban women.
3. There are much lesser educational facilities for girls than those for boys. There are 509% more primary, 107% middle and 350% high schools for boys than those for girls.
4. In 1998, 15% population of Nara compared to 44% population in Khairpur was literate.
5. There are 2 times more degree colleges for men than for those for girls.

A comparison of the education figures noted during PSLM 2004-05 and those in 2006-07 reveal some important trends. In 2004-05, it was noted that 48% population (10+) of the district was literate. This figure was noted to have reduced to 46% in 2006-07. Likewise in 2004-05, 45% population (15+) was noted to be literate. The figure was found to have reduced to 43% in 2006-07.

Health

Khairpur has the highest number of Basic Health Units and second highest number of Rural Health Centers in the Sindh province. The high number of Rural Health Centers is due to the fact that Khairpur has second highest number of talukas following Thatta. Normally a rural health center is established in each taluka. However majority of the people falling sick prefer to consult private health facilities. The PSLM 2006-07 notes that in urban areas 82% and in rural areas 70% patients consult or are taken to private health facilities. Likewise, the effectiveness of mobile health facilities like Lady Health Visitors and Lady Health Workers is also not very high. For instance only 17% rural women receive pre natal care from a LHW.

The target of saving children from preventable fatal diseases is also far from being achieved. 34% male and 29% female children are yet to be fully immunized. Majority of rural women are not able to receive pre natal and post natal care from a formal health facility or health provider. 58% urban and 36% rural women receive some kind of prenatal care from a formal

health service. 59% urban and 24% rural women receive Tetanus Toxoid injection. 83% deliveries in rural and 67% in urban areas take place in homes normally in the presence of some relative/neighbor women or traditional birth attendant. 27% urban and 23% rural women receive some kind of post natal care from a formal health facility.

Livelihoods

Census 1998 gives an idea of the livelihood options available to the urban and rural residents and trends prevalent in Khairpur. 3/4th of the district's population resides in the rural areas. Agriculture and its allied sectors are thus a major source of livelihood for some 60% households. Self employment is an option for most to earn their living. 63% urban and 76% rural earners are self employed. Government jobs accommodate 26% urban and 11% rural labor force whereas, formal private sector absorbs 4% rural and 8% urban labor force. Since women don't receive directly the earnings from sectors they contribute in, they are not considered formal labor force. According to the census 1998, some 18% population of the district was found to be economically active or termed the income earners.

Khairpur is rich in mineral resources especially oil and gas. However local population complains that the fruits of the riches of the district in the form of employment opportunities in the gas fields, for instance, are not reaped by them. A visit to Nara revealed that private gas exploring companies have invested heavily in improving the road infrastructure in this desolated area of the district. A discussion with the locals suggest that the improved road infrastructure has contributed a lot in connecting desert people with main towns and thus have opened new opportunities for them. Further the compensation paid by the gas companies to acquire lands has also brought well being for the locals.

Khairpur is an important contributor to the economy of Sindh and Pakistan in the form of its agricultural produce and mineral resources especially natural gas. Khairpur is the second most populous district of Sindh following Karachi and hence its contribution in the form of human resource also becomes quite important. The district is the biggest producer of dates and bananas in Sindh. Likewise the district is the 2nd and 3rd largest producer of wheat and cotton respectively in Sindh. The agriculture sector thus stands extremely important for the economy of district and improvement made in and issues faced by the agricultural sector directly affect majority of the district population.

Being an abode of a number of important historically significant towns, places, buildings and monuments, Khairpur holds great potential for development of tourism which can markedly contribute to the local economy.

The civic infrastructure especially in Khairpur city is in much better shape compared to other districts especially of Sindh. The PSLM 2006-07 throw some light on the perception of Khairpur's residents towards economic conditions of households, their communities and public services. 37% urban and 21% rural household consider that their economic situation has improved compared to the last year while 14% of urban and same proportions of rural households consider that their economic situation has deteriorated. 11% urban and 3% rural households consider that the economic situation of their community has improved compared to the previous year. When it comes to the level of satisfaction with the public services as noted by PSLM 2006-07, there are certain sectors that need attention of the policy makers and development planners.

During the survey people were found to be least satisfied with the performance of Police, agriculture extension, veterinary and family planning services currently available to them. As mentioned earlier, the agriculture sector is the backbone of district's economy like rest of the country. An analysis of the agriculture sector's situation and trends becomes quite pertinent should one want to understand and design strategies for livelihood improvement. A major portion, 84% or 13,18,000 hectares of district's land is currently not being cultivated where as 78% land is not available or fit for cultivation. The areas lying adjacent to the river Indus were once covered with riverain forests but the increase in population and quest to bring more and more lands under plough, these areas were deforested to make way for crop fields. Currently only 2% area of the district is under the forest cover.

Expansion in agriculture continues and yearly increase in the cultivated area is being noted. From 2000-01 to 2003-04, there was a 28% increase in the irrigated area, compared to 372% increase in un-irrigated area was recorded. During the same period, there was 23% increase in canal irrigated area compared to 123% increase in tube well irrigated area was noted. These statistics in turn points to two major trends:

1. The expansion in the rain fed agriculture especially in the desert zone for which the natural vegetation is being removed,
2. Widening gap between supply of canal irrigation water and irrigation demand. The gap is being tried to fill with the installation of private tube wells. This is evident

from the fact that just in one year from 2003-04 to 2004-05, an increase of 390% was recorded in the installation of private tube wells. The increasing dependence on ground water is contributing to falling water tables and salinity.

The expansion in agricultural activity and quest to increase the production is increasing farmers dependence on chemical fertilizers and thus adding to environmental pollution. From 1999 to 2002-03, 30% increase in the use of chemical fertilizers was recorded in Khairpur.

3.10 AGRICULTURE

Agriculture is the most dominant economic activity in the area which is supported by the Nara canal running along the entire length of the game reserve. Major crops in the area are wheat and cotton; however, barley, oil seed, fodder, sugar cane, pulses, and vegetables are also grown. Fodder crops are grown in order to meet the feed requirement of livestock farmed by locals especially the pastoralists in the desert.

Cultivations of fodder crops are suitable to local climate and water availability. Use of fertilizer and pesticides is more for commercial crops such as cotton. These are available from Chundko, Nara gate, Tajjal and Kathore. Farmers also buy pesticides and fertilisers from "middlemen" who supply them on a loan basis. In this case rates of fertilizer and pesticides are higher than the prevailing market rates. Tractors are used in agriculture and are available on rent for Rs. 150/ on cash payment or on Rs. 200 to 250 in which cash recovery is made at the time of harvest. Use of thresher is also common for wheat and other crops. Rate for threshing is Rs. 30/ per 40 Kg. Women mainly do picking of cotton and rates are adjusted according to work performed. Presently cotton picking rates are rupees 100 per 40 Kg.

3.11 LIVESTOCK

Horses and donkeys are used for transportation over small distances since road transportation facility is limited in the area. Cattle are used in agricultural fields and also for carts. Goats and sheep wool is sold in the town. Milk is cheap in the area and consumed in the restaurants. Locals use milk and its bi-products as their major ingredient of diet. Some of the farmers use farmyard manure in agricultural fields.

Animal markets are at Chundko, Khairpur, Nawabshah and Sukkur. Feeding practices include free grazing and stall feeding in the area. Under free grazing system desert range-lands and government lands along canal banks and lakes are used. Agriculture fields after harvest are also used for grazing. Mostly animals are grazed by family members in range-lands. In some cases herder, locally known as Dhaniar, are also employed. These shepherds are paid for their services on the basis of the number of animals or on a monthly basis in cash or in kind. In some cases shepherd also have share in offshoots of small ruminants if grazing arrangements are on a longer basis.

Under this system, owner of animals only initially invest by buying animals and then shepherd is responsible for all-major husbandry practices and activities. In some areas, especially in some parts of the desert animals graze on their own, i.e. without herder. It shows clearly that theft elements and activities are not common in these particular areas. Women equally contribute in livestock keeping. They are responsible for watering, feeding, milking, and even grazing of small ruminants. Women also keep poultry mainly for domestic consumption of eggs and meat.

3.12 ECONOMY

There are two major occupations in the area - agriculture and livestock keeping. A small number of people are also engaged in service providing sectors such as artisan work, trade, business and jobs in formal and informal sectors. People also rent tractors and agricultural machinery to supplement their income. Transportation is another sector where many people are involved and run motorcycles and Datsun on a daily basis and provide old four-wheel trucks (locally called kekras) on rent to locals. During off-season tenants also work in towns as laborers'. Labor work is available at Chundko and people from surrounding villages and area come here for daily labour work. Some people also go to Kadanwari to work at the Kadanwari gas field. Pashtuns from Baluchistan and other areas also occasionally come here during the winter season and engage in woodcutting and brick making. Rates for unskilled labourer is Rs. 100/ and skilled person like mason can get Rs. 250/ day. There is one cotton ginning factory in the area where many people are employed during the ginning season.

3.13 SOCIAL ORGANIZATION

People live on kinship and lineage basis in villages and hamlets. Except for a few cases, people belonging to the same tribe, caste and having common ancestry reside in a village and villages are, thus, named after the tribal head. Elders and people with religious and

educational background are respected by community members. Main tribes and casts in this area are Syed, Shar, Chang, Rajpar, Aradhin, Dasti, Malah, Khaskheli, Chano, Sahtha, Mullo, Bhurgarri, Gahoo, Gopang, Rid, Nizamani, and Baloch.

Every village has its own tribal or cast leader called a 'Wadera'. Generally a 'Wadera' has a large land holding and can influence his tenants, landless people, artisans and members of low castes due to their dependency on land and agriculture. He maintains relationship with outside world, government officials and politicians. He is also well aware of activities within his area and is a source of much information. He is respected by all and arbitrates disputes of minor nature. More than 98 % people are Muslims in this area. Hindus mainly reside in Choondiko, a very small percentage live in the desert. Hindus at Chundko are considered well-off people and are engaged in trade and business. According to local people 20 years ago Hindus had a strong hold in Chundkoo with almost all shops owned by them. Among Muslims, majority of people are Sunni with a small percentage of Shia Muslims also.

All villagers maintain mosques, Eidgah/Imambargah. Sectarian violence is not common in the area. Marriages are arranged in early ages. Girls even get engaged few weeks after their birth. This practice is, however, slowly changing. Marriages outside the caste or tribe are not preferred. Marriage is performed in a simple manner and extra expenditure is avoided. In very limited cases dowry payment is done which is approximately 20 to 30 thousand rupees. Most of the families live in a joint family system. In this way they form a basic social and economic unit. Among Sunni Muslims women are not given property rights whereas Shia Muslims do recognize this right.

Polygamy is also common among people. Divorce is not very common as people marry in close relatives and close ties among lineage do not permit this. No cases of honour killing (karo-kari) have been reported from the area. The people in this area speak Sindhi and Saraiki languages. Men can generally speak and understand Urdu.

Since many people here follow Pirs in religious thoughts, there are Khalifas or representatives of Pir Sahib among local population. They are respected on Pir's behalf and arbitrate matters, which the village elder is unable to handle. As this system of arbitration is efficient and cost effective, small disputes are rarely reported to the police. Usually disputes are on land, water and livestock.

Muslim people are followers of Pir Sahib Pagaro and Pir of Ranipur. Nearly 80% follow Pir Pagaro Sahib and rests are followers of Pir of Ranipur. Their lives are fairly influenced by these religious leaders. The followers, in every way of life, acclaim respect of these leaders. The religious leadership influences elections at local, provincial and national level. These leaders also visit their followers according to

3.15 WATER SUPPLY

Ground water is the source of potable water supply throughout the game reserve including most of the desert area. Most of the houses have their own individual hand pumps; however, in some instances different houses share a single hand pump. Water from these hand pumps are used for drinking purposes, washing and other necessary uses. There is neither any shop nor any technician who can repair hand pumps. These services are only available at Chundko. There is no major government installed water supply scheme in the area. However, SAZDA has developed water storage tanks and hand dug wells in some of the villages and in some villages, local bodies have also helped by providing hand-pumps. Water quality in most of the areas is good for drinking purposes. Water table varies from village to village, i.e. from 15 feet to 55 feet.

TECHNICAL PLANT SPECIFICATIONS

4.1 TECHNICAL ASPECTS

Co-generation based on Rankine Cycle is not new to the sugar industry, however Co-generation based on high pressure boilers and extraction condensing or straight condensing machines are definitely new to the industry. In olden days, the power cycle adopted was bases on 14 kg/cm² (g) and 21 kg/cm² (g). This has been gradually increasing to 32 kg/cm², (g), 45 kg/cm², (g), 66 kg/cm², (g), 86 kg/cm², (g), 110 kg/cm², (g) and now stabilized at 124 kg/cm² (g) and 5400C. With the size of the co-generation plant going above 40MW the use of 135 kg/cm² (g) pressure cycles are being explored. The following highlights a few of the technical issues for designing of the co-generation projects.

4.2 THE BASIC DESIGN OF THE CO-GENERATION PLANT

Basically the co-generation plant configuration is site specific, even though, even though some amount of standardization could be made for the gross root plants. The scheme should consider the available bagasse, the variation in the bagasse availability. Considering the variation in the bagasse availability and the possible variation in the process steam consumption and the number of days of operation, maybe it is better to go down size of the plant and ensure maximum plant load factors. The plant cycle should be optimized to give best efficiency.

Even though there is no limit to the achievable steam pressure and temperatures with bagasse firing, it is essential a cost benefit study is made before deciding on the steam cycle parameters. In such a study proper consideration should be given to the cost aspect of the higher grade metallurgy of the turbine and the boiler, specifically the super-heater and the piping. With the industry almost systems; their co-generation efficiency ranges from 84% to 92%.

Based on priority in utilizing the available energy, electricity or heat, co-generation systems are classified as topping cycle (where priority is for generating electricity) and bottoming cycle (where heat takes priority over electricity).

Topping Cycle

The topping cycle is the most commonly used method of co-generation. In this cycle, fuel is used first for producing electricity and then for heat. Steam turbine topping cycles are commonly used in the pulp and paper industry; heat recovery and combined cycle systems are used in many chemical plants; and gas turbine cycles are useful in central heating or cooling systems.

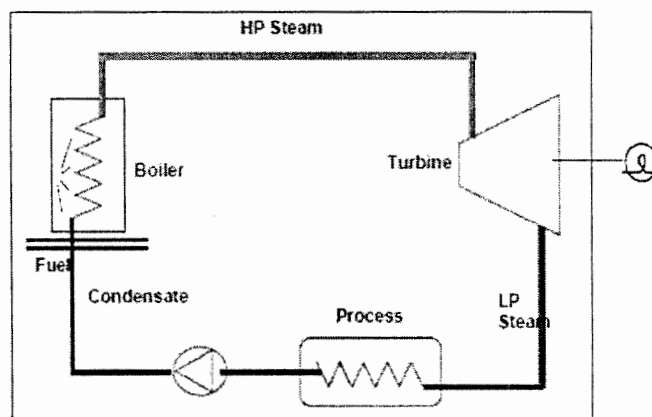


Fig 4.1: Back-pressure steam turbine system

4.3 TECHNOLOGY DESCRIPTION

Basic Process

The thermodynamic cycle for the steam turbine is known as the Rankine cycle. This cycle is the basis for conventional power generating stations and consists of a heat source (boiler) that converts water to high pressure steam. In the steam cycle, water is first pumped to elevated pressure, which is medium to high pressure, depending on the size of the unit and the temperature to which the steam is eventually heated. It is then heated to the boiling temperature corresponding to the pressure, boiled (heated from liquid to vapor), and then most frequently super heated (heated to a temperature above that of boiling).

The pressurized steam is expanded to lower pressure in a turbine, then exhausted either to a condenser at vacuum conditions, or into an intermediate temperature steam distribution system that delivers the steam to the industrial or commercial application. The condensate from the condenser or from the industrial steam utilization system is returned to the feed water pump for continuation of the cycle.

Components

A schematic representation of a steam turbine power system is shown below.

In the simple schematic shown, a fuel boiler produces steam which is expanded in the steam turbine to produce power. When the system is designed for power generation only, such as in a large utility power system, the steam is exhausted from the turbine at the lowest practical pressure, through the use of a water-cooled condenser to extract the maximum amount of energy from the steam.

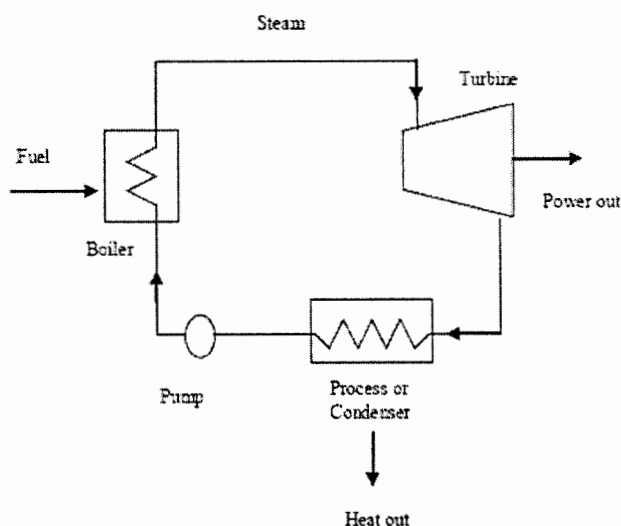


Fig 4.2: Boiler / Steam Turbine System

Details of the Generation Facility/ Power Plant

Table 4.1: General Information

1.	Name of facility	Ranipur Sugar Mills (Pvt.) Limited
2.	Registered/ Business Office	C-98, khahkshan Scheme -5, Block-2, Clifton, Near Ziauddin Hospital, Karachi
3.	Plant Location	Ranipur, Taluka Kot Digi, Dist. Khairpur Sindh.
4.	Type of Generation Facility	Bagasse Based Cogeneration Facility.

Table 4.2: Plant Configuration

1.	Plant size Installed Capacity (Gross ISO)	60.0 MW
2.	Type of Technology	Steam Turbine Generator
3.	Number of Unit	01
4.	Size of Units (MW)	60 MW

5.	Unit Make & Model	Any reputed local/ foreign make
5	Commissioning/Commercial operation date	First quarter of 2019
6.	Minimum Expected Life of the Facility form Commercial Operation/Commissioning Date	30 Years

Table 4.3 Fuel Details

(i)	Primary Fuel	Bagasse	
(ii)	Alternate / Backup Fuel	Biomass	
(iii)	Fuel Source for each of the above (i.e Imported/ Indigenous)	Indigenous	
(iv)	Fuel Source (Imported / Indigenous)	Primary Fuel	Alternate / Back-up Fuel
		Bagasse	Biomass
(v)	Fuel Supplier	From Ranipur Sugar Mills (Pvt) Ltd.	Local Supplier
(vi)	Supply Arrangement	Primary Fuel	Alternate/ Back- Up Fuel
		Through Conveyor Belts/	Through Loading
(vii)	Sugarcane Crushing Capacity	8000 TCD	
(viii)	Bagasse Generation Capacity	2400 Ton/Day	
(ix)	Fuel Storage facilities	Primary Fuel	Alternate/ Back- Up Fuel
		Within Premises Yard	Near Boiler
(x)	Capacity of Storage Facilities	Primary Fuel	Alternate/ Back- Up Fuel
		120000 Ton	x
(xi)	Gross Storage Capacity	Primary Fuel	Alternate / Backup Fuel
		130000 Ton	x

Table 4.4 Emission Values

1.	Oxide of Sulfur (Sox)	Not Applicable
2.	Oxide of Nitrogen (NOx)	650 mg/Nm ³
3.	Carbon Monoxide (CO)	986 mg/Nm ³
4.	Particulate Matter (PM ₁₀)	Not Applicable

Table 4.5 Cooling System

1.	Cooling water Source/Cycle	Canal Water obtained through tube wells/Closed Loop + R.O(Treated water)
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Table 4.6: REL Plant Description

(i)	Plant size installed capacity	60 MW Gross
(ii)	Type of Technology	Cogeneration Plant with high pressure boiler of 110 - 125 bar, 540 °C class; turbo generator with extraction steam and condenser, cooling towers and balance of plant
(iii)	Number of Units/Size (MW)	1 x 60MW
(iv)	Fuel	Bagasse except for start up
(iv)	Unit Make/ Model & Year of Manufacture	New boiler, turbo generator, switch gear and BOP
(v)	Commissioning/ Commercial Operation date of each Unit of the Generation Facility	Within 20 months from financial Close
(vi)	Expected Useful Life of the each Unit of the Generation Facility from its Commercial Operation/ Commissioning Date	30 years
(vii)	Expected Remaining useful Life of each Unit of the Generation Facility (at the time of grant of (Generation License)	30 years
(viii)	Generation Voltage	11000 Volts
(ix)	Frequency	50 Hz

(x)	Power Factor	0.8
(xi)	Automatic Generation Control (AGC)	Yes
(xii)	Ramping Rate	3.2 Kw/sec
(xiii)	Time required to Synchronize to Grid	10 hours for cold start

Table 4.7: Technical Details of Proposed Co-Generation Power Plant

Description	Season	Off- Season
Days	120	60 (as per availability of bagasse)
Gross Capacity (MW)	60	± 60
Auxiliary Consumption (MW)	6.0	6.0
Net Installed capacity (MW)	54	54
Sugar Mills Consumption (MW)	8.0	0.50
Exportable Capacity to Grid	46	53.5
Total Bagasse Generated	960,000 Ton	-----

Table 4.5: Cooling System

(i)	Cooling Water Source / Cycle	Canal water + R.O (Treated water)
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4.4 SAFETY AND ECOLOGY

The design of safety into the project is desirous for extending life cycle, improving returns on investment and, decreasing unprecedented shutdowns.

By adhering to established standards as above and undertaking required inspections, the safety of plant and equipment can be built into the project. For pressurized equipments like boilers, de-aerators and turbines, annual hydrostatic pressure inspection will be planned. Continuous monitoring of flue gas temperatures will indicate the need of fire/water side cleaning. A R.O. plant and softening plant are included in the project cost to decrease or avoid water side scaling and deposition on turbine blades. All transformers will be certified by the electrical inspector and annual inspection/filtration of cooling oil is planned. The proposed power evacuation system will play a pivotal monitoring power and heat parameters to prevent any undesired excesses.

Procurement of safety devices like welders goggles, helmets, hand gloves, ear-muffs etc. are planned. On commissioning, of the cogeneration plant is also planned to conduct a safety awareness programme for operators by an experienced professional firm. Major undesired exposures the cogeneration plant Operator will be exposed to are high sound levels of turbine steam pressure and Temperature and high voltage (11,000/415 volts). Adequate thermal electrical insulation and sound proof barriers are being built into the project. Any project involving power generation raises environment and ecological concern. However, this additional cogeneration project assists in directly reducing associated pollution and warming follows of power generation.

During the power plant operation bagasse is the principal source of fuel. The ash content is at 2%. The fly-ash generated will be collected in Dust Collector or electrostatic precipitators. Appropriate designs and emissions levels are taking into consideration.

Project Schedule

The cogent power plant will operate 24 hrs / day and for about 180 days per year. The season days have been assumed at 120 during which the project will operate on 70% Bagasse 30% on Biomass during the season, the captive steam and power requirements of RSML will be met and the exportable surplus will be sold to SEPCO grid. The off season days have been assumed at ± 60 during which the plant will operate on saved and stored bagasse & biomass. The entire power generated in the off season, excluding the captive requirement excluding the captive requirement for the cogen plant, will be sold to the SEPCO grid.

The plant will generate 46 MW of exportable surplus during the season, equivalent to 43.68 million KWH after applying a derating factor of 0.90. The plant will also generate 14 MW of exportable power during the off season, equivalent to 73.188 million KWH after applying a derating factor of 0.95. Thus, for seasonal and off-seasonal operations: the net power export will be 192.42 million units, at maximum utilization unit.

ANALYSIS OF ALTERNATIVES

5.1 ALTERNATIVES

It is the requirement of the Asian Development Bank as well as best practice that the EIA/IEE should consider project alternatives and their relative potential impact on the environment. Alternatives must, however, be both practical and reasonable, within the overall constraints of the proposed project development.

5.2 NO ACTION (ZERO OPTION)

This option requires the EIA/IEE to consider the potential positive and negative impacts that may arise if the project did not go ahead.

The project will be using available quantity of bagasse (renewable energy source) for additional generation of 46 MW electricity during 120 days of cane crushing season and for around 60 days of off-season at 53.5 MW to supply much needed power to national grid. Displacement of fossil fuel energy production during bagasse use period will also result in a net reduction in CO₂ emissions so contributing to the control of climate change.

The project would also provide additional revenue to the sugar industry which will help to secure its future and so offset some of the current and increasing pressures on the financial viability of the sugar sector.

The zero option would, however, remove the potentially negative impacts of the proposed development, primarily associated with the clearing of existing ecological habitats during the construction of the transmission line to Gambat Grid Station approximately 7 Km from the generation facility .

5.3 PROPOSED POWER PLANT SITE

When the need for additional power generation capacity was confirmed, REPL had reviewed a number of siting options prior to the selection of the final proposed location.

- Selection of site for installation of a cogeneration power plant is based on following criteria: Availability of land;
- Availability of fuel
- Availability of water for cooling and process;
- Access to electric grid station and transmission system;
- Availability of infrastructure;
- Availability of managerial and skilled personnel.

The cogeneration power plant, under reference of this EIA/IEE is intrinsically linked with the sugar factory as discussed within the project description. This linkage is twofold, firstly the supply of bagasse from the factory to the cogeneration power plant and secondly the provision of steam to the factory from the cogeneration plant with the return of good quality condensate. Due to the physical restrictions within the RSML factory site and the requirements for the two plants to be in close proximity, no practical alternative site locations exist, except the site that has been proposed

Major relocation of the plant, away from the RSML sugar factory, would add significant additional capital and operational costs (steam/condensate pipe work and bagasse transport) and was not therefore considered a practical or reasonable option. The base case site is also the least environmentally sensitive of any alternative location that may exist around the site

The proposed site; adjacent to the RSML; has the entire infrastructure available. Water will be available from tube-wells (ground water) and an alternative surface water source of nearby canal; NTDC / SEPCO proposed grid station is located at about 6 kilometers distance; adequate workshop and maintenance facilities, along with trained, experienced and skilled workshop technicians are available who are already running the workshop available at RSML. Similarly, experienced and skilled managerial manpower is also available in the area.

5.4 COGENERATION OPTION

Cogeneration has been adopted as standard means of energy generation since long by the sugar industry. With the use of efficient processing and energy management systems, energy from bagasse, over and above the sugar factory needs, is available and can be

exported conveniently in the form of electric power. Application of sugar cogeneration will replace a part of fossil-based electricity generation leading to a more sustainable mix in power generation.

Cogeneration with power export will assist in reducing greenhouse gases (GHGs) emissions. In order to continue reliable, efficient and safe operation, the existing steam and power generation system will be closed down and replaced with the more efficient system in proposed power plant. Presently, sugar industry world-wide except for Pakistan uses high-pressure boilers by burning bagasse and the high pressure steam for power generation and the low pressure steam for process heat. Introduction of high-pressure technology in Pakistan will result in more power production to supply to the national grid and less emission of GHG.

Options for Boilers

The only option to use the bagasse effectively is the combustion route, where the bagasse is combusted in a boiler to generate steam. However, because of the nature of and characteristics of bagasse, both atmospheric & circulating fluidized bed technologies (AFBC and CFBC) and the pulverized fuel (PF) combustion technologies are not suitable for the stand-alone combustion of bagasse.

Many options are available for selection of boiler pressures and temperature. Table - 4.1, below, presents the production of steam and expected power generation at various pressure/temperature levels.

Table 5.1: Production of Steam and Power Generation

Steam Cycle (Bar/o C)	Steam Production (tonnes)	Power Generation (kW)
21/340	2.50	227.3
32/380	2.43	286.0
42/400	2.40	313.0
45/440	2.33	328.0
67/480	2.27	378.0
87/510	2.24	401.0
110/535	2.21	437.0

Using bagasse as fuel and travelling grate furnace, the optimum option is selection of boiler pressure at or close to 110/535 (pressure/temperature). At higher pressures the steam turbine efficiency also increases. A change in pressure cycle from 21/340 to 110/535 increases the power generation by 88%. Under the circumstance the selected boilers with high pressure is the best alternative. MEL is considering with a 67/580 or 110/535 boiler.

Fuel Options

Fossil energy resources consist primarily of natural gas and furnace oil. Domestic oil supply is considered negligible and natural gas resources are becoming scarce in Pakistan. However, substantial coal deposits are available in the country, but mining of all of them is quite expensive. Moreover, domestic coal is very high in sulphur and ash content, which will lead to severe environmental hazards. Since the proposed power plant is situated in a rich cane area that offers to be the ideal fuel source.

5.5 RENEWABLE ENERGY ALTERNATIVES

Renewable resources such as wind power, micro hydro, and solar photovoltaic are not feasible options at the current time, but are subject to future consideration, particularly with respect to the price of fuel. With availability of bagasse for approximately 180 days the option of using other renewable energy sources will be highly cost ineffective.

ENVIRONMENTAL MANAGEMENT PLAN

6.1 INTRODUCTION

Environmental Management Plan (EMP) is the key to ensure a safe and clean environment. A project may have identified proper mitigation measures but without a management plan to execute it, the desired results may not be obtained. The present chapter on Environment Management Plan envisages proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities.

The following issues have been addressed in this EMP:

- Mitigation measures for abatement of the undesirable impacts caused during construction and operation stages
- Details of management plans
- Institutional set up for implementation of the EMP commissioning of the project
- Expenditures for environmental protection measures.

EMP included four major elements:

1. **Commitment and Policy:** The project will strive to provide and implement the Environmental Management Plan that incorporates all issues related to air, land and water.
2. **Planning:** This includes identification of environmental impacts, legal requirements, and setting environmental objectives.
3. **Implementation:** This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken.
4. **Measurement and evaluation:** This includes monitoring, corrective actions, and record keeping.

The EMP's that will be put into place consist of those during construction and operating stages of the project and includes the following elements:

- Water Management,
- Hazardous and Solid Waste Management,
- Air Pollution Control and Management
- Noise Control and Management,
- Storm Water Management,
- Land Management and plantation
- Occupational, Safety and Health Issues,
- Best Management Practices,,
- Environmental Monitoring,
- Emergency Response Plans for Emergency Scenarios,
- Environmental Management System.

6.2 IDENTIFICATION OF IMPLEMENTING AUTHORITY

The responsibility for the implementation of the EMP will be with the Promoter and Contractor (P & C). An environmental management cell (EMC) will be established by the Promoter and Contractor (P & C) for implementing the mitigation measures.

In addition, an Environmental Officer will be appointed by project authorities for management of the project with the objective of reviewing and assessing the progress made by the concession company in implementing the suggested mitigation measures.

Implementation of Recommended Mitigation Measures

The mitigation measure for the impact is made a part of proposed activities. The major instruments of environmental management will be monitoring performance of the construction by the EMC. The conditions, which must be fulfilled, are suggested below:

- All necessary measures and precautions will be cited so that the execution of the works and all associated operations on site or off-site are carried out in conformity with statutory and regulatory environmental requirements.
- Necessary measures and precautions to avoid nuisance or disturbance arising from the execution of the works will be included, preferably at the source itself.
- Wastes such as spoil or debris or silt from the sites will be immediately removed and the affected areas will be restored to their original state.

Objective

Environmental management and monitoring is an activity to be undertaken by the administration over the entire cycle showing its commitment towards meeting environmental regulations/standards and good housekeeping practices as well as maintaining health and safety standards. The environmental management and monitoring programs are implemented from the very early stages of planning and execution phases. Infact the authorization of the company is the point of initiation of environmental management plan. The monitoring data, observations recorded and test results/analysis are vital and formulate legal documents to be kept in safe custody and may be provided to competent authority as and when required in accordance to Sindh Environmental Protection Act (SEPA) 2014.

The primary objective of this EMP is to establish and implement the Environment, Health & Safety Protection Procedure in its best spirit through the company staff at operational level. Faran Power Ltd (the proponent) has committed for developing and implementing a comprehensive EMP to help ensure a high level of environmental protection throughout this undertaking. This EMP provides the procedures and mitigation matrix for the production of Fiber.

Purpose

Outline environmental protection measures to be followed during operation:

- Ensure that commitments to minimize environmental impacts are met;
- Document environmental concerns and appropriate protection measures;
- Provide concise and clear instructions to company personnel and contractors regarding procedures for protecting the environment and minimizing environmental impact;
- Provide a reference document for personnel when planning and/or conducting specific activities;
- Provides contingency plans for accidental events;
- Communicate changes in the program through the revision process; and
- Post implementation phase monitoring.

Scope and outlines

To ensure a holistic framework for the management of the environmental impacts, during the planning, design and construction phases of the Ranipur Energy Pvt. Ltd. project, the EMP initially sets out general environmental requirements, which are applicable to these phases of the project.

The EMP also contains a series of project environmental specifications designed to avoid, minimize and ultimately manage the potential environmental impacts of the Ranipur Energy Pvt. Ltd. project during the planning, design and construction phases of the project.

Environmental impacts anticipated during the operational and maintenance phase of the project will be managed in terms of an Environmental Management System (EMS), which the Concessionaire is required to implement. This EMP does not cover decommissioning and closure environmental requirements since the commission period will span approximately 30 years and it is expected that a further period may be negotiated thereafter. Given the expected lifespan of such an investment and facility, decommissioning or closure cannot be envisaged for a long time to come.

This is the main step to identify the areas for environmental management and priorities to be given based on the risk involved. Following criteria will be used to determine priorities for attention:

- Impact on physical and biological environment of the area;
- Contribution to innovation and definition of best environment practice;
- Compliance with statutory requirements and other environmental commitments;
- Availability of resources (for environmental management).

EMP acknowledges the social and cultural dimensions of responsible environmental management alongside the biological and physical aspects reflecting a holistic view as a "human ecosystem". The Scope of EMP includes the following functional areas:

6.3 CONSTRUCTION PHASE

Environment impacts during construction phase involve site preparation, transportation of construction materials and equipment and construction of the infrastructure. However, this is not a long-term impact as this is a temporary phase.

From the above activity, it is envisaged that there will be some effect on the existing environment. To minimize these impacts, the proponent will undertake all preventive and remedial measures, which are outlined hereunder. Following control measures are recommended to mitigate the probable adverse impacts.

Site Management Plan

During the construction phase, as soon as construction is over, the construction waste will be disposed through authorized contractor.

Air Quality Management

During construction period, there is likelihood of generation of dust and NO_x emissions. This can be attributed to leveling activity and vehicular movement. The transport vehicles should be properly maintained to minimize smoke in the exhaust.

Water sprinkling is suggested to address this issue. Since there is likelihood of fugitive dust from the construction activity, material handling and from the truck movement in the premises, following are the measures to be taken during construction phase.

Sprinkling of water shall be done. Construction equipment shall be maintained and serviced regularly such that the gaseous emissions from this equipment are maintained within the design specifications; and Construction activities shall be restricted to daytime only as much as possible to minimize disturbance during nighttime.

Water Quality Management

The raw water for the various purposes will be supply from site water supply. Proper Construction methodologies will be adopted in order to avoid any nuisance.

Noise Quality Management

Generation of noise during construction phase is due to construction activity in the area. Vibration levels will also increase due to these activities. However, these impacts will be short term and intermittent in nature. Nevertheless, the following mitigation measures shall be adopted:

- Inlet and outlet mufflers should be provided, which are easy to design;
- Earmuffs should be provided to the workers and it should be enforced to be used by the workers;

- Noise prone activities shall be restricted to the extent possible during night time, particularly during the period between 10 pm to 6 am in order to have minimum environmental impact on the workers as well as on the surrounding; and No worker shall be allowed to expose to more than 90 dB (A) in an 8-hour shift and under no circumstance the noise level from any equipment shall be greater than 115 dB (A).

Ecological Aspects

A comprehensive greenbelt development will improve the ecological condition of the region.

Site Security

Adequate security arrangement should be made to ensure that the workers are not exposed to the potential hazards of construction activities.

Facilities to be provided by the Contractor

The contractor has to provide following facilities to construction work force:

- First Aid:** At work place, first aid facilities should be maintained at a readily accessible place where necessary appliances including sterilized cotton wool etc shall be available. Ambulance facilities should be kept readily available at workplace to take injured person to the nearest hospital.
- Potable Water:** Sufficient supply of water fit for drinking should be provided at suitable
- Security:** The promoter will provide necessary security to work force

Table 6.1: Reporting of the Major- Parameters and Responsible Organization during construction

Sr. No	Project Related Issue	Action to be Taken	Responsible Organization
1	Air Quality	<ul style="list-style-type: none"> Vehicles and machineries will be regularly maintained so that emissions conform to SEQS Standards. 	Promoter through prospective contractor

2	Noise Level	<ul style="list-style-type: none"> ▪ Proper maintenance Of machinery and vehicles ▪ Construction activities ▪ strictly prohibiting between 10 pm and 6 pm near habitation; ▪ Provision of using ear plugs by workers being exposed to high noise levels ; <p>Vegetative and solid barrier along inhabitant centre and Sensitive receptor.</p>	Promoter through prospective contractor
3	Water Quality	NA	Promoter through prospective contractor
4	Traffic management	Traffic control during Construction phase. Safety measures will also be undertaken by installing road signs and making for safe and smooth movement of traffic	Promoter and contractor
5	Utilities	Initiate and complete the process of shifting the utilities	

6.4 OPERATION PHASE

Air Environment

The EMP in the design stage endeavors to mitigate the problems related to health, safety and environment at the initial stage itself. The bagasse fired power plant will be designed taking into account all applicable standards norms both for regulatory and safety purpose.

For the proposed cogeneration power plant project special arrangements will be made to avoid any ambient air contamination in and around the project site, and all the appropriate measures shall be taken to minimize any air emission from the plant.

6.5 WATER MANAGEMENT

Water Use

The water requirement of the total project will be met from site water supply system. Proper sewage treatment facility will be provided. The treated water will be used for flushing and gardening purposes within the project area.

Noise & Vibration Management

The ambient noise levels in the region are within the permissible limits. However, the greenbelt to be provided will further attenuate the noise levels.

Green Belt Development

The greenbelt helps to capture the fugitive emissions and to attenuate the noise generated in the premises apart from improving the aesthetics of the site. Plantation program should be undertaken in all available areas. The plant species selected for greenbelt shall include the native species.

Environmental Training

The Environment Management Cell (EMC), in addition to implementing and monitoring different environmental attributes, will also be actively involved in imparting training and raising environmental awareness of Construction Engineers/ Contractors and other staff members/ workers so as to enable them take the environmental aspects into consideration as and when required. In the long run, the EMC can impart additional and specialized training in environmental management of the road and building construction system.

Budgets for Environmental Management Plan

The environmental cost is consists of monetary value of the mitigative measures adopted to minimize the negative impact of project on environment. The Plan outlines mitigation and other measures that will be undertaken to ensure compliance with environmental laws and regulations and to reduce or eliminate adverse impacts

Mitigation Plan

Pollution preventive and risk management strategies aimed to eliminate, reduce, and minimise emissions and contaminations that help in safe guarding the ecosystems and promote the health of natural communities. It is suggested that concerned persons are responsible to work on the mitigation and frequencies as mentioned in Ranipur Energy Pvt.

Ltd. will be required to hold on these improvement measures throughout this operation shown in Mitigation Matrix Table 7.2.

Table 6.2: Mitigation Matrix

S.No	Possible Mitigation Measures	Responsibility	Frequency
1	Water consumption to be regularly monitored and usage optimized	EHS In charge	Continue
2	Drinking water must be chlorinated before use	EHS In-charge	Continue
3	Drinking water must be meet WHO guidelines	EHS In-charge	Regular Inspection
4	Waste water must be treated before discharge	EHS In-charge	Continue
5	External illumination to be kept at minimum recommended value	EHS In-charge	During night hours
6	Public consultation to be carried out	EHS In-charge	As and when required
7	All solid waste to be separated, regularly monitored and disposed of by waste management contractor	EHS In-charge	Regularly
8	Workers hiring to be done with good behavior and extensive experience	Head of Department	At time of recruitment

Table 6.3: Mitigation/ Compensation measures during Operation Phase

Potential Impact	Mitigation Action
Landscape	<ul style="list-style-type: none"> To the extent possible, develop a green belt along the facilities boundary area and other open spaces, to create to some extent a natural landscape. The flora to be used for such green belt should be tolerant to the local climate requiring just minimum water to survive.
Ambient Air Quality	<ul style="list-style-type: none"> Continuous monitoring of ambient air for SO₂, NO_x, CO and PM to be carried. Height of the stacks to be maintained at 100

	<p>meters, as indicated in the project feasibility report, for enhanced dispersion of pollutants.</p>
Surface Water	<ul style="list-style-type: none"> Waste water treatment, as described in this report, to be carried out continuously and monitored before mixing with water in the recipient water body.
Ground Water	<ul style="list-style-type: none"> Regular inspection of facilities for intercepting leaking and spilled liquids. Hazardous chemicals shall be handled only in appropriate segregated, sealed and bundled areas at site.
Solid Waste	<ul style="list-style-type: none"> All solid wastes shall be disposed off according to a set procedure and record of sales will be kept to track at any time when it is required. The contractors to whom any waste is to be sold shall be fully made aware of the environmental impacts and health effects of the waste to be sold to him. He shall be provided instructions for reuse/handling of such wastes in environmentally sustainable way.
Noise	<ul style="list-style-type: none"> Equipment will be acoustically shielded and /or lagged as far as possible. A noise measurement campaign during full operation at operation start should be implemented to verify the real noise levels are in line with the standards under " Pollution Prevention and Abatement Handbook, World Bank Group, Effective July 1998" for Thermal Power: Guidelines for New Plants. Workers should be obliged to use ear protection in areas within the plant and for specific work that exceed the tolerable maximum noise limits.
Bagasse Handling	<ul style="list-style-type: none"> Adequate measures, as practiced internationally, should be adopted to eliminate the possibility of

HSE Objectives

Health

- Completion of work without compromises to health of personnel;
- No illness (severe);
- Availability of safe and cold drinking water.

Safety

- Development of safety culture that protects safety personnel;
- Zero lost time incident;
- Implementation of weekly based incentive scheme to reinforce positive behavior.

Environment

- No environmental damage.

Implementation

The responsibility of developing promoting and implementing the safety policy and objectives lies with management supervisors at all levels and individual employees have responsibility for safety and those working in the factory. The following is a description of the reporting/communication procedures relevant ion project safety.

6.7 HSE MANAGEMENT

Ranipur Energy Pvt. Ltd. will identify and manage the risks associated with such challenges by developing strategies defined in the following area

- Physical controls rules;
- Motivation and behaviour;
- Awareness;
- Social activities.

Personal Controls and Rules

- The proponent will ensure that all employees are provided with necessary personal protective equipment (PPE);
- Selection of proper PPEs must be ensured and they shall comply with applicable rules of safety;
- Items of PPEs as described below shall be worn where required by the task or in work area designated by the safety officer.

Risk Identification/Management

- A hazard register shall be maintained;
- All employees/visitor shall be made aware of all possible hazards by identifying them their preventive measures suggested/taken and communicated by safety manager.

Job Safety Analysis

- Safety issues, their associated risks shall be maintained;
- Control measures pertinent to particular jobs shall be identified.

Accident/Incident Reporting

Purpose is to ensure that all incidents involving injuries/fatalities to persons engaged by Faran Power Ltd., loss damages to factory's equipment are promptly recorded and investigated so that recurrence could be taken after taking relevant procedures.

- To comply with legal and statutory requirement;
- To maintain a good record.

Training

An accident/incident prevention program will be chalked out for all employees. Emergency drills will be conducted to ensure as out accidents cases and maintain the effectiveness of emergency response plans outlines and have a proper's training face actual incidence.

Motivation and Behavior

Ultimate success of HSE plan depends on the motivation and behaviour of individuals and team working in the factory and availability of environmental protection measures. Strict action will be taken against individuals whose negative behaviour threatens the HSE Plan.

Monitoring and Control Inspections

The safety manager will carry out inspections for compliance of HSE policy/procedures on a regular basis. Non-compliance issue will be discussed with the personnel involved. Corrective measures will be taken and resolved within 3 days of reporting. The safety officer and implementation officer will carry out joint inspection.

Management Approach

The environmental management will require specific approach in order to handle the issues effectively. It is expected that a certain degree of redundancy is inevitable across all

management's level, but should be in that order to ensure the compliance with the environmental management plan.

Ranipur Energy Pvt. Ltd. will look after the compliance on EMP during operations. It will ensure that all activities executed must comply all the environmental regulations as well as cooperation will be bridged with concerned regulatory authorities such as Environmental Protection Agency.

Some of the approaches to be followed during the environmental management practices are given below:

- Complying with the relevant legislation and regulations;
- Regularly reviewing of the impacts on the environment;
- Developing appropriate indicators in order to monitor core impacts;
- Setting appropriate annual objectives, targets and publicly reporting on progress;
- Monitoring supplier's environmental management arrangements;
- Using sustainable materials (e.g. recycled paper and water based inks) for office supplies and environmentally safe raw materials with recycling options where appropriate;
- Communicating openly with internal and external stakeholder on environmental issues, if relevant.

6.8 GENERAL ORGANIZATIONAL STRUCTURE FOR ENVIRONMENTAL MANAGEMENT

There will be about 55 employees working at Ranipur Energy Pvt. Ltd. among which 5-8 will be management staff while the rest will be hired on contract basis. Organizational chart is attached below to show the key management of the power plant.

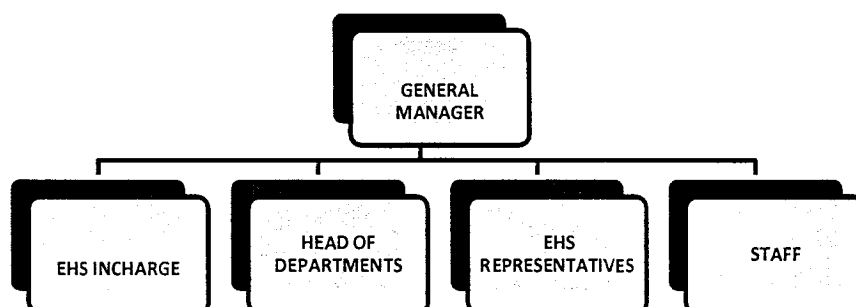


Figure 6.1: Organo-gram of Ranipur energy (Pvt) limited

Roles and Responsibilities

Environmental management should be the integral part of the corporate policy of Faran Power Ltd. Therefore, committing to reduce the environmental impacts will reflect the management approach and ensures that good environmental performance in this area accelerate the running of well managed and efficient business. Main responsibility for environmental performance will be governed by the GM of Ranipur Energy Pvt. Ltd. while daily management will be supervised under the direction of Production Manager. It is recommended that at least one EHS In charge shall be working under the head of GM during operation phases. A brief structure of roles and responsibilities is given below:

General Manager

Environmental management plan will be regulated by GM. He will be responsible to report CEO, who will be the decision making authority. Some of the important roles to be provided by GM are given below:

- To consider and react to issues and solutions by the EHS department;
- To cooperate and consult with relevant environmental agency in order to perform in better way;
- To evaluate the progress of development and implementation of the management plan;
- To approve any change in decision making system in consultation with Manager EHS, if appropriate.

Head of Department

The role of Head of Department is vital in the growth of industry. The success of an EMP always depends on the performance of the Head of Department. Following are some of the roles and responsibilities given should be designated to the Head of Department.

- To identify issues and where possible propose solutions for inclusion in the management plan review process;
- To ensure that the points and views of staff and others are considered and appropriately incorporated in the EMP accordingly;
- To improve coordination and exchange of information between top management, employees, contractors etc;
- To contribute towards the actions to deliver the management plan and ensure its continued development;

- To review EMP every year, taking issues and change EMP accordingly with the solutions and suggestions;
- To monitor the progress and development and implementation of the management plan;
- The role of EHS officer will be empowered by the EHS In charge.

EHS Representative

The superficial responsibilities which EHS Officer will have to perform include:

- To integrate, as far as possible, the aims and objectives of different users within agreed plan;
- To maintain balanced, holistic approach to the solution of concerned issues in accordance with the compliance to the legislative requirements;
- To provide professional guidance on questions relating to the environment management and issues raised by contractors/ relevant personals;
- To progress of the EMP process through development towards implementation.

Hierarchy of prevention

Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work (also known as the Framework Directive), is a European Union directive that sets out general principles for protection of workers' Occupational safety and health. It provides the enabling framework for a number of other individual directives concerned with specific aspects of health and safety.

Table 6.4 Personal Protective Equipments

Protection for	Equipment Protection	Against
HEAD	Safety Helmet	Fall of objects/hitting against objects
	Electric resistance helmet.	During maintenance, etc. Electric shock.
	Welder's leather cap	Splashing of liquid etc.
EYE	Panorama goggles with clear plastic Vision.	Oil & paint splashes, dust, chips
		High temperature flame during furnace work

	Spectacle-type goggles with blue lens	
EAR	Ear plugs or muffs	High noise level
NOSE	Dust mask, fumes mask, oxygen mask & air mask.	Fine dust particles, fumes and gas.
FACE	Welding helmet and shield	Welding fumes, sparks and UV rays.
BODY	Apron Safety belt Hand gloves Electric resistance gloves Canvas gloves	Falling of hot chips, slag, etc. Falling of persons from height Heat radiation Electric shocks Contact with oil, grease, etc.
LEG	Safety shoes	Striking by objects, fall of objects and stepping on sharp or on hot objects.

The general principles of prevention set out in Article 6(2) of Council Directive 89/391/EEC are specified in the following schedule:

- Avoiding risks;
- Evaluating the risks which cannot be avoided;
- Combating the risks at source;
- Adapting the work to the individual, especially as regards the design of workplaces, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work-rate and to reducing their effect on health;
- Adapting to technical progress;
- Replacing the dangerous by the non-dangerous or the less dangerous;
- Developing a coherent overall prevention policy which covers technology, organization of work, working conditions, social relationships and the influence of factors relating to the working environment;
- Giving collective protective measures priority over individual protective measures; and
- Giving appropriate instructions to employees.

For making this brochure aiming the reduction of chemicals exposure in woodworking industries, the following general safety guidelines were always taken into account: hazard prevention and hazard control.

6.9 HAZARD PREVENTION

Three methods are used to control the impact of hazards. The first, and preferred, is to prevent the hazard at the design stage. The second is to identify and eliminate existing hazards. The third is to reduce the likelihood and severity of mishaps from hazards that cannot be eliminated.

Hazards may be prevented through appropriate actions during the design process, when operating procedures are developed, and when equipment is purchased. The hazard would never exist if we anticipated problems and eliminated them before they reached the worker.

Hazard control

When hazard prevention is not possible, one must control their effects by reducing the severity of the hazards. Several methods to control hazard possibilities exist. These methods are developed into benchmarks in the following order:

- Reduction through engineering & warnings;
- Reduction through practices at organizational level, and
- Reduction through protective equipment.

CONCLUSION

7.1 GENERAL

An Initial Environmental Examination report has been prepared for cogeneration power plant based on existing baseline environmental quality data, Identification and prediction of significant environmental impacts due to the proposed activity followed by delineation of appropriate impact mitigation measures and suggestion for implementing this measure by preparing an Environmental Management Plan (EMP).

7.2 PROLOGUE

- The land is acquired from the existing area of Ranipur Energy (Pvt) limited. Proposed project will be in existing available area; therefore issues related to land acquisition, displacement of people etc do not arise.
- Use of latest technology and modernization will lead to energy saving, cost effective and efficient process.
- Cogeneration plant using biomass will solve problem of baggasse disposal.
- Recycle and reuse of bagasse in boiler have added advantage of pollution control as ash and sulfur content is very low.
- Water requirements of the plant will be met from the existing tube well facility
- Energy produce from cogeneration plant will be supplied to national grid

During the environmental examination study, all possible environmental aspects have been adequately addressed and necessary control measures have been suggested to meet with statutory requirements. The proposed project will contribute to economic growth in indirect way and may help in meeting the increasing demands of power if proved to be economically beneficial for future production.

Environmental setting Base line data for environmental aspects like air, water, soil, land use land cover was collected from the plant location. Ecological conditions were studied in within 10km radius there is no reserve forest, natural park or wildlife sanctuary in this area. The area is flat and no recorded sites of archaeological importance exist. Socio economic

study was carried out through primary survey and secondary information from census report. Meteorological data was obtained and Wind rose was drawn and according to wind condition.

Ambient air quality was measured from the project area. All parameter values were within SEQS limits. Similarly noise measured from project location in the study area was within prescribed regulation.

Environmental Assessment

Environmental Assessment has been carried out component wise. Mitigation measures are described in detail for each environmental aspect. The proposed Project brings in multifold advantages. Not only does it produce clean, pollution free energy, by adopting environmental friendly and latest technology. Design criteria for power plant are arrived at with best available alternative. Project also has the capacity to provide employment to the people living in and around that area.

Environmental & Management Monitoring Program

Environment monitoring program has been delineated to confirm all the compliances as per the statutory requirement and minimize environmental risk and to identify unexpected changes in the operation of the plant. The post project monitoring program is suggested to keep all the environmental parameters under control throughout the operation of various processes. Cost for environmental monitoring plan has also been computed.

7.3 CONCLUDING REMARKS

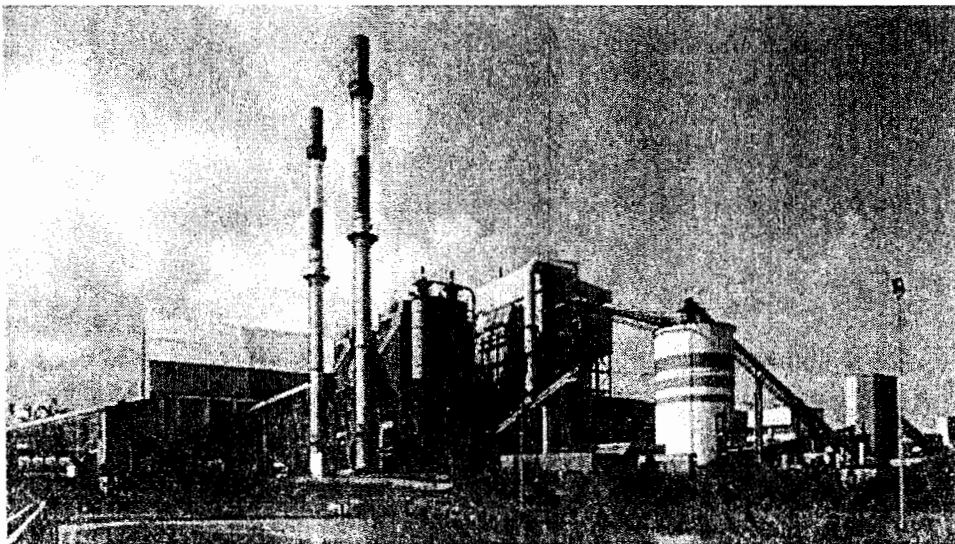
Occupational, safety, health and environmental protection policy has been given to have safe operations in the plant. Green belt development, provision of rain water harvesting structure, corporate social responsibility and occupational health surveillance program has been emphasized to have better environmental statues in and around the plant premises. Environmental Management Plan has been described to facilitate effective management to control mitigation measures during operation storage handling and transportation of materials and products. Manpower requirement has been identified to control all environmental and legislative issues related to the industry.



INTERCONNECTION STUDY

For

**60 MW Ranipur Energy Private Limited at
Ranipur Sugar Mills (Pvt.) Limited, Ranipur,
Taluka Kot Digi, District Khairpur, Sindh**



Draft Report

(May 2017)

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Executive Summary

- ❖ The Final Report for interconnection of 60 MW Ranipur Energy Private Limited Bagasse based Cogeneration Power Plant with SEPCO grid system is submitted herewith.
- ❖ Ranipur Energy Private Limited would like to go for high pressure cogeneration with the aim of exporting a maximum of 53.5 MW electrical power to the national grid.
- ❖ The study objective, approach and methodology have been described and the plant's data received from the Client is validated.
- ❖ This study is carried out for Ranipur Energy Private Limited (located in district Khairpur) in the network of SEPCO. The network around Ranipur Energy Private Limited (referred to as Ranipur PP in the remainder of the report) at 132 kV and 11 kV has been modeled as shown in Appendix-B.
- ❖ The nearest SEPCO grid facility available for interconnection to Ranipur PP would be Gambat 132 kV Grid Station.
- ❖ Keeping in view the location of Power Project, it is proposed to connect Ranipur Energy Private Limited via looping In-Out of the existing Transmission Line from Gambat 132 kV grid station to Maharabpur 132kV grid station. The looping distance as confirmed from site visit would be 5.11 km and the conductor used would be Lynx. The scheme is shown in Sketch-2 in Appendix-B.
- ❖ Ranipur PP would generate power at 11 kV voltage level from where it is stepped-up to 132 kV using three 132/11 kV transformers with rating of 31.5/40 MVA.
- ❖ The proposed scheme would require two 132 kV line bays at the 132 kV substation of Ranipur PP for the connection to 132 kV Gambat grid station and Maharabpur 132 kV grid station. Furthermore it would also require three transformer bays for the connection of three 132/11 kV transformers with rating of 31.5/40 MVA.
- ❖ With the gross capacity of 60 MW, the spillover from Ranipur PP would be 53.5 MW in Off-Season and 46 MW in the Crushing Season.
- ❖ In view of planned COD of Ranipur PP in April 2019, the above proposed interconnection scheme has been tested for steady state conditions through detailed load flow studies for the following scenarios:



- Peak and Off-Peak Load Conditions of September 2019 for maximum hydropower dispatches in the grid during the off-season for Ranipur PP.
- Peak Load Conditions of Summer 2019 for maximum thermal power dispatches in the grid during the crushing season for Ranipur PP.

The system conditions of normal and N-1 contingency have been studied to meet the reliability criteria of NEPRA Grid Code.

- ❖ The proposed scheme of interconnection has also been tested for the extended term scenario of peak load conditions of summer 2022 for steady state conditions.
- ❖ Steady state analysis by load flow for all the scenarios described above reveals that the proposed scheme is adequate to evacuate the spillover of up to 53.5 MW power of the Plant under normal as well as contingency conditions.
- ❖ The short circuit analysis has been carried out to calculate maximum fault levels at Ranipur PP and the substations of 132 kV in its vicinity. We find that the fault currents for the proposed scheme are within the rated short circuit capacities of switchgear installed at these substations. There are no violations of exceeding the rating of the equipment due to contribution of fault current from Ranipur PP.
- ❖ The maximum short circuit levels of Ranipur PP 132 kV are 8.91 kA and 7.91 kA for 3-phase and 1-phase faults respectively for the year 2019. It would be advisable to go for standard size switchgear of short circuit rating of 40 kA for the 132 kV substation of Ranipur PP. It would provide large margin for any future increase in short circuit levels due to future generation additions and network reinforcements in this area.
- ❖ The dynamic stability analysis of proposed scheme of interconnection has been carried out for September 2019. The stability check for the worst case of three phase fault right on the 132 kV bus bar of Ranipur PP substation followed by the final trip of one 132 kV circuit emanating from this substation, has been performed for fault clearing of 5 (100 ms) and 9 cycles (180 ms), in case of stuck breaker, as understood to be the normal fault clearing time of 132 kV protection system. The stability of system for far end faults of 3-phase occurring at 132 kV bus bar have also been checked. The proposed scheme successfully passed the



dynamic stability checks for near and far faults for the most stringent cases. The system is found strong enough to stay stable and recovered with fast damping.

- ❖ The proposed scheme of interconnection has no technical constraints or problems, it fulfills all the criteria of reliability and stability under steady state load flow, contingency load flows, short circuit currents and dynamic/transient conditions; and is therefore recommended to be adopted.



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Appendices

Appendix –A:

- NTDC Generation Plan
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- Technical Data provided by the Sponsor

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Appendix –C: Plotted Results of Load Flow for Chapter – 5

Appendix –D: Results of Short Circuit Analysis for Chapter – 6

Appendix –E: Plotted Results of Stability Analysis for Chapter – 7

Appendix –F: Dynamic Data for Ranipur PP



1. Introduction

1.1 Background

Ranipur Energy Private Limited PP would like to go for high pressure cogeneration with the aim of exporting spillover power to the National Grid. The electricity generated from this project would be supplied to the grid system of SEPCO through 132 kV grids available in the vicinity of this project. The nearest grid facility is Gambat 132 kV Grid Station as shown in Appendix-B.

1.2 Objectives

The overall objective of the Study is to evolve an interconnection scheme between Ranipur PP and SEPCO network, for stable and reliable evacuation of the electrical power generated from this plant, fulfilling N-1 reliability criteria. The specific objectives of this report are:

1. To develop scheme of interconnections at 132 kV for which right of way (ROW) and space at the terminal substations would be available.
2. To determine the performance of interconnection scheme during steady state conditions of system, normal and N-1 contingency, through load-flow analysis.
3. To check if the contribution of fault current from this new plant increases the fault levels at the adjoining substations at 132 kV voltage levels to be within the rating of equipment of these substations, and also determine the short circuit ratings of the proposed equipment of the substation at Ranipur PP.
4. To check if the interconnection withstands dynamic stability criteria of post fault recovery with good damping.

1.3 Planning Criteria

The planning criteria required to be fulfilled by the proposed interconnection is as follows:

Steady State:

Voltage	$\pm 5 \%$, Normal Operating Condition
	$\pm 10 \%$, Contingency Conditions
Frequency	50 Hz Nominal
	49.8 Hz to 50.2 Hz variation in steady state
	49.4 - 50.5 Hz, Min/Max Contingency Freq. Band

Short Circuit:

Substation Equipment Rating for 132 kV should be 40 kA.

Dynamic/Transient:

The system should revert back to normal condition after dying out of transients without losing synchronism with good damping after permanent three-phase fault on any primary transmission element; including: transmission circuit, substation bus section, transformer, or circuit breaker. It is assumed that such a fault shall be cleared by the associated circuit breaker action in 5 cycles.

In case of failure of primary protection (stuck breaker case), the total fault clearing time from the instant of initiation of fault current to the complete interruption of current to isolate the faulted element, including the primary protection plus the backup protection to operate and isolate the fault, is equal to 180 ms (9 cycles) for 132 kV and higher voltage levels.



2. Technical Data

The number of generating units at Ranipur PP is one. The following data have been provided by the Client:

2.1 Ranipur PP data

Generator data:

Gross capacity of power plant = $1 \times 60 = 60$ MW

Generating Voltage = 11 kV

Power factor = 0.80 lagging

Crushing Season:

Load + Auxiliary Consumption = 14 MW

Spillover to the Grid = 46 MW

Off-Season:

Load + Auxiliary Consumption = 6.5 MW

Spillover to the Grid = 53.5 MW

GSU Transformer = 31.5/40 MVA (x3)

Proposed GSU Transformer reactance = 15 % @ 40 MVA

2.2 Network data

The latest Generation Expansion Plan and Load Forecast has been used as provided by NTDC and is shown in Appendix-A.

The 132 kV network in the area near Ranipur PP are as shown in Sketches in Appendix-B. The system data of SEPCO has been used as already available with PPI.



3. Study Approach and Methodology

3.1 Understanding of the Problem

Ranipur Energy Private Limited PP would like to go for high pressure cogeneration with the aim of exporting a maximum of 53.5 MW supply to the grid during the Off-Season and 46 MW in Crushing Season. The proposed Power Project is going to be embedded in the transmission network of SEPCO through this nearest available 132 kV network.

The adequacy of SEPCO network of 132 kV in and around the proposed site of Ranipur PP has been investigated in this study for absorbing and transmitting this power fulfilling the reliability criteria.

3.2 Approach to the problem

The consultant has applied the following approaches to the problem:

- A base case network model has been prepared for September 2019 (Off-Season) and January 2020 (Crushing Season) after the commissioning of Ranipur PP in April 2019, comprising all 500 kV, 220 kV and 132 kV system, envisaging the load forecast, the generation additions and transmission expansions for that year particularly in SEPCO.
- Month of September 2019 and January 2020, while representing Off-Season and Crushing Season respectively, also represent high water and low water conditions respectively in the grid system. Thus both the high water and low water flow patterns can be observed allowing us to judge the maximum impact of the plant on the transmission system in its vicinity. In addition, case for extended term scenario of the year 2022 has also been studied.
- Interconnection scheme without any physical constraints, like right of way or availability of space in the terminal substations, have been identified.
- Technical system studies for peak load conditions to confirm technical feasibility of the interconnections have been performed. The scheme will be subjected to standard analysis like load flow, short circuit, and transient stability study to check the strength of the machines and the proposed interconnection scheme under disturbed conditions.

- Determined the relevant equipment for the proposed technically feasible scheme.
- Recommended the technically most feasible scheme of interconnection.



4. Development of Scheme of Interconnection

4.1 The Existing and Ongoing Network

60 MW Bagasse based cogeneration PP, Ranipur Energy Private Limited is located in District Khairpur embedded in the distribution network of SEPCO. The existing 132 kV network available around Ranipur PP is shown in Sketch-1 in Appendix-B. The nearest interconnection facilities of SEPCO at time of commissioning of Ranipur PP would be 132 kV Gambat Grid Station.

There is a strong 220 kV network in the vicinity connecting Rohri-New 220/132 kV grid station with Shikarpur 220 kV and Guddu 220 kV substations. A strong system helps in stable operation of a power plant.

4.2 The Scheme of Interconnection of Ranipur PP

Keeping in view the above mentioned 132 kV network available in the vicinity of the site of the Ranipur PP, the interconnection scheme for Ranipur PP has been developed. According to the scheme, it is proposed to connect Ranipur Energy Private Limited via looping In-Out of the existing Transmission Line from 132 kV Gambat grid station to Maharabpur 132 kV grid station. The looping distance as confirmed from site visit would be 5.11 km and the conductor used would be Lynx. The scheme is shown in Sketch-2 in Appendix-B. The network of Ranipur PP has been modeled at 132 kV and 11 kV.

5. Detailed Load Flow Studies

This study is carried out for Ranipur Energy Private Limited (located in District Khairpur) in the network of SEPCO. Different Load flow scenarios were studied that are explained below:

5.1 Peak Load Case September 2019, without Ranipur PP

A base case has been developed for the peak load of September 2019 using the network data of NTDC and SEPCO available with PPI, after updating with latest load forecast and expansion plan of NTDC and SEPCO. The peak load of the year 2019-20 for SEPCO has been modeled as per the latest PMS Demand forecast obtained from NTDC. It is attached in Appendix-A.

In this scenario, the proposed Ranipur PP is not considered. The results of load flow for this base case are plotted in Exhibit 0.0 of Appendix-C. The system plotted in this Exhibit comprises of 132 kV network feeding Gambat, Kunb, Rohri, Maharabpur, Kandiaro and the surrounding areas.

The load flow results show that the power flows on all the circuits are within their normal rating. The voltage profile of these surrounding substations is also within normal limits.

For N-1 contingency conditions we have performed the following cases

Exhibit - 0.1	Gambat to Mahrabpr 132 kV Single Circuit Out
Exhibit - 0.2	Rohri-NW to Gambat 132 kV Single Circuit Out
Exhibit - 0.3	Mahrabpr to Kandiaro 132 kV Single Circuit Out
Exhibit - 0.4	Gambat to Rasulabad 132 kV Single Circuit Out
Exhibit - 0.5	Kunb to Gambat 132 kV Single Circuit Out

We see that in all the cases the power flows on all circuits remain within their rated limit. Also the bus voltages are within the acceptable operating range.

5.2 Peak Load Case September 2019, with Ranipur PP

Base case of September 2019 earlier prepared was used and Ranipur PP was modeled in the case as per proposed interconnection scheme that was finalized after conducting site visit of the Sugar Mill.



The results of load flow for this case are plotted in Exhibit 1.0 of Appendix-C. The load flow results show that the power flows on all the circuits are within their normal rating. The voltage profile of these surrounding substations is also within normal limits.

For N-1 contingency conditions we have performed the following cases

Exhibit - 1.1	Ranipur SPP 132/11 kV Single Transformer Out
Exhibit - 1.2	Ranipur SPP to Gambat 132 kV Single Circuit Out
Exhibit - 1.3	Ranipur SPP to Mahrabpr 132 kV Single Circuit Out
Exhibit - 1.4	Rohri-NW to Gambat 132 kV Single Circuit Out
Exhibit - 1.5	Mahrabpr to Kandiaro 132 kV Single Circuit Out
Exhibit - 1.6	Gambat to Rasulabad 132 kV Single Circuit Out
Exhibit - 1.7	Kunb to Gambat 132 kV Single Circuit Out

We see that in all the cases the power flows on all circuits remain within their rated limit. Also the bus voltages are within the acceptable operating range.

5.3 Off-Peak Load Case September 2019, with Ranipur PP

Off-Peak Load Case for the same month of September 2019 is studied to test the system under light load conditions after the addition of four newly proposed PPs in the network.

The results of this scenario are plotted in Exhibit 3.0. We find no capacity constraints on 132 kV circuits under normal conditions i.e. without any outages of circuits.

The power flows on the circuits are seen well within the rated capacities and the voltages on the bus bars are also within the permissible operating range of $\pm 5\%$ off the nominal.

N-1 contingency analysis has been carried out and the plotted results are attached in Appendix – C as follows;

Exhibit - 2.1	Ranipur SPP 132/11 kV Single Transformer Out
Exhibit - 2.2	Gambat to Ranipur SPP 132 kV Single Circuit Out
Exhibit - 2.3	Ranipur SPP to Mahrabpr 132 kV Single Circuit Out
Exhibit - 2.4	Rohri-NW to Gambat 132 kV Single Circuit Out

Exhibit - 2.5	Mahrabpr to Kandiaro 132 kV Single Circuit Out
Exhibit - 2.6	Gambat to Rasulabad 132 kV Single Circuit Out
Exhibit - 2.7	Kunb to Gambat 132 kV Single Circuit Out

We see that in all the contingency cases, in the event of outage of any circuit, the intact circuits remain within the rated capacity. Also the bus bar voltages are well within the permissible limits in all the contingency events.

5.4 Peak Load Case January 2020, with Ranipur PP in Crushing Season

The scheme of interconnection modeled in the load flow for Ranipur PP is as described in Chapter-4.

Load flow studies have been carried out for January 2020 because it represents the maximum thermal power dispatch conditions in the grid during the Crushing Season condition for Ranipur PP. Thus the loading on the lines in the vicinity of Ranipur PP will be maximum, allowing us to judge the maximum impact of the plant on the transmission system in its vicinity. The results of load flow with Ranipur PP interconnected as per proposed scheme are shown in Appendix-C.

The results of Normal case of this scenario are plotted in Exhibit 3.0. We find no capacity constraints on 132 kV circuits under normal conditions i.e. without any outages of circuits.

The power flows on the circuits are seen well within the rated capacities and the voltages on the bus bars are also within the permissible operating range of $\pm 5\%$ off the nominal.

N-1 contingency analysis has been carried out and the plotted results are attached in Appendix – C as follows;

Exhibit - 3.1	Ranipur SPP 132/11 kV Single Transformer Out
Exhibit - 3.2	Gambat to Ranipur SPP 132 kV Single Circuit Out
Exhibit - 3.3	Ranipur SPP to Mahrabpr 132 kV Single Circuit Out
Exhibit - 3.4	Rohri-NW to Gambat 132 kV Single Circuit Out
Exhibit - 3.5	Mahrabpr to Kandiaro 132 kV Single Circuit Out
Exhibit - 3.6	Gambat to Rasulabad 132 kV Single Circuit Out
Exhibit - 3.7	Kunb to Gambat 132 kV Single Circuit Out



We see that in all the contingency cases, in the event of outage of any circuit, the intact circuits remain within the rated capacity. Also the bus bar voltages are well within the permissible limits in all the contingency events.

5.5 Peak Load Case 2022: Extended Term Scenario

We have also studied the future scenario of Year 2022 to assess the impact of the plant in the extended term after addition of generation and other reinforcements in the system as per the generation and transmission plan of NTDC and SEPCO.

The results of Normal case of Peak 2022 are plotted in Exhibit 4.0. The power flows on the circuits are seen well within the rated capacities and the voltages on the bus bars are also within the permissible operating range of $\pm 5\%$ off the nominal.

We find no capacity constraints on 132 kV circuits under normal conditions i.e. without any outages of circuits.

N-1 contingency analysis has been carried out and the plotted results are attached in Appendix – C as follows;

Exhibit - 4.1	Ranipur SPP 132/11 kV Single Transformer Out
Exhibit - 4.2	Gambat to Ranipur SPP 132 kV Single Circuit Out
Exhibit - 4.3	Ranipur SPP to Mahrabpr 132 kV Single Circuit Out
Exhibit - 4.4	Rohri-NW to Gambat 132 kV Single Circuit Out
Exhibit - 4.5	Mahrabpr to Kandiaro 132 kV Single Circuit Out
Exhibit - 4.6	Gambat to Rasulabad 132 kV Single Circuit Out
Exhibit - 4.7	Kunb to Gambat 132 kV Single Circuit Out

The power flows on the circuits are seen well within the rated capacities and the voltages on the bus bars are also within the permissible operating range of $\pm 10\%$ off the nominal for contingency conditions' criteria

We find that there are no capacity constraints in the proposed connectivity scheme of Ranipur PP.

5.8 Conclusion of Load Flow Analysis

Different Load flow scenarios were studied for this study of Ranipur Energy Private Limited. It is concluded that the proposed interconnection scheme of Ranipur PP is adequate to evacuate the spillover electrical power from Ranipur PP under normal and contingency conditions tested for peak and off-peak load conditions of September 2019, peak load conditions of January 2020 and an extended term scenario of the Year 2022. In all the normal and contingency cases, we find that the loading on the circuits remain within the rated capacity. Also the bus bar voltages are well within the permissible limits in all the normal and contingency events. Hence, the proposed interconnection scheme of Ranipur PP has no constraints according to the Load Flow Analysis.



6. Short Circuit Analysis

6.1 Methodology and Assumptions

The methodology of IEC 909 has been applied in all short circuit analyses in this report for which provision is available in the PSS/E software used for these studies.

The maximum fault currents have been calculated with the following assumptions under IEC 909:

- Set tap ratios to unity
- Set line charging to zero
- Set shunts to zero in positive sequence
- Desired voltage magnitude at bus bars set equal to 1.10 P.U. i.e. 10 % higher than nominal, which is the maximum permissible voltage under contingency condition.

For evaluation of maximum short circuit levels we have assumed contribution in the fault currents from all the installed generation capacity of hydel, thermal and nuclear plants in the system in the year 2019 i.e. all the generating units have been assumed on-bar in fault calculation's simulations.

The assumptions about the generator and the transformers data are the same as mentioned in Ch.2 of this report.

6.2 Fault Current Calculations without Ranipur PP – Year 2019

In order to assess the short circuit strength of the network of 132 kV without Ranipur PP for the grid of SEPCO in the vicinity of the site of the Plant, fault currents have been calculated for balanced three-phase and unbalanced single-phase short circuit conditions. These levels will give us the idea of the fault levels without Ranipur PP and later on how much the contribution of fault current from Ranipur PP may add to the existing levels.

The results are attached in Appendix – D.

The short circuit levels have been calculated and plotted on the bus bars of 132 kV of substations lying in the electrical vicinity of our area of interest i.e. Gambat, Kunb, Maharabpur, Kandiaro and the surrounding bus bars and are shown plotted in the Exhibit 5.0 attached in Appendix-D. Both 3-phase and 1-phase fault currents are

indicated in the Exhibit which are given in polar coordinates i.e. the magnitude and the angle of the current. The total fault currents are shown below the bus bar.

The tabular output of the short circuit calculations is also attached in Appendix-D for the 132 kV bus bars of our interest. The total maximum fault currents for 3-phase and 1-phase short circuit at these substations are summarized in Table 6.1. We see that the maximum fault currents do not exceed the short circuit ratings of the equipment at these 132 kV substations which normally are 20 kA, 25 kA or 31.5 kA for older substations and 40 kA for new substations.

Table-6.1
Maximum Short Circuit Levels without Ranipur PP - Year 2019

Substation	3-Phase Fault Current (kA)	1-Phase Fault Current (kA)
Gambat 132 kV	9.83	6.82
Rasulabad 132 kV	6.37	4.21
Kandiaro 132 kV	7.15	4.73
N.Feroze 132 kV	6.10	4.02
Bhirya Road 132 kV	5.46	3.59
Tharu Shah 132 kV	5.36	3.50
Mahrabpur 132 kV	5.99	3.94
Kunb 132 kV	7.88	5.27
Rohri-NW 132 kV	17.46	14.49
Rohri-2 132 kV	16.96	13.93
Meridian Energy 132 kV	6.06	3.96
HNDS Energy 132 kV	6.06	3.96
Helios Power 132 kV	6.06	3.96
Nara-C1 132 kV	6.05	3.95
Rohri-NW 220 kV	16.98	12.49
SHKPR 200 kV	29.46	21.54



6.3 Fault Current Calculations with Ranipur PP – Year 2019

Fault currents have been calculated for the electrical interconnection of proposed scheme. Fault types applied are three phase and single-phase at 132 kV bus bars of Ranipur PP itself and other bus bars of the 132 kV substations in the electrical vicinity of Gambat, Kunb, Maharabpur, Kandiaro. The graphic results showing maximum 3-phase and 1-phase fault levels are indicated in Exhibit 5.1. Both 3-phase and 1-phase fault currents are indicated in the Exhibit which are given in polar coordinates i.e. the magnitude and the angle of the current. The total fault currents are shown below the bus bar.

The tabulated results of short circuit analysis showing all the fault current contributions with short circuit impedances on 132 kV bus bars of the network in the electrical vicinity of Ranipur PP are placed in Appendix-D. Brief summary of fault currents at significant bus bars of our interest are tabulated in Table 6.2

Table-6.2
Maximum Short Circuit Levels with Ranipur PP – Year 2019

Substation	3-Phase Fault Current (kA)	1-Phase Fault Current (kA)
Ranipur-SPP 132 kV	8.91	7.91
Gambat 132 kV	10.65	8.81
Rasulabad 132 kV	6.65	4.75
Kandiaro 132 kV	7.24	5.08
N.Feroze 132 kV	6.14	4.17
Bhirya Road 132 kV	5.51	3.74
Tharu Shah 132 kV	5.40	3.62
Mahrabpur 132 kV	5.76	4.11
Kunb 132 kV	8.21	5.86
Rohri-NW 132 kV	18.07	15.49
Rohri-2 132 kV	17.48	14.72
Meridian Energy 132 kV	6.12	4.02
HNDS Energy 132 kV	6.12	4.02

Helios Power 132 kV	6.12	4.02
Nara-C1 132 kV	6.11	4.01
Rohri-NW 220 kV	17.17	12.91
SHKPR 220 kV	29.65	21.79

Comparison of Tables 6.1 and 6.2 show slight increase in short circuit levels for three-phase and single – phase faults due to connection of Ranipur PP on the 132 kV bus bars in its vicinity. We find that even after some increase, these fault levels are below the rated short circuit values of the equipment installed on these substations. The maximum short circuit level of Ranipur PP 132 kV is 8.91 kA and 7.91 kA for 3-phase and 1-phase faults respectively.

6.5 Conclusion of Short Circuit Analysis

The short circuit analysis results show that for the proposed scheme of interconnection of Ranipur PP there is no problem of violations of short circuit ratings of the already installed equipment on the 132 kV equipment of substations in the vicinity of Ranipur PP due to fault current contributions from this power house under three-phase faults as well as single phase faults.

The short circuit level of the Ranipur PP 132 kV is 8.91 kA and 7.91 kA for 3-phase and 1-phase faults respectively for the year 2019. Therefore, industry standard switchgear of the short circuit rating of 40 kA would be fine to be installed at 132 kV switchyard of Ranipur PP taking care of any future generation additions and system reinforcements in its electrical vicinity and also fulfill the NEPRA Grid Code requirements specified for 132 kV Switchgear.

7. Dynamic Stability Analysis

7.1 Assumptions & Methodology

7.1.1 Dynamic Models

The assumptions about the generator and its parameters are the same as mentioned in Ch.2 of this report.

We have employed the generic dynamic models available in the PSS/E model library for dynamic modeling of the generator, exciter and the governor as follows;

Generator	GENROU
Excitation System	EXST1
Speed Governing System	TGOV1
Inertia Constant	H = 2.4 MW-sec/MVA

7.1.2 System Conditions

The proposed scheme as described in Chapter-4 has been modeled in the dynamic simulation.

All the power plants of WAPDA/NTDCL and IPPs from Tarbela to Hub have been dynamically represented in the simulation model.

7.1.3 Presentation of Results

The plotted results of the simulation runs are placed in Appendix-E. Each simulation is run for its first one second for the steady state conditions of the system prior to fault or disturbance. This is to establish the pre fault/disturbance conditions of the network under study were smooth and steady. Post fault recovery has been monitored for nine seconds. Usually all the transients due to non-linearity die out within 3-4 seconds after disturbance is cleared in the system.

7.1.4 Worst Fault Cases

Three phase faults are considered as the worst disturbance in the system. We have considered 3-phase fault in the closest vicinity of Ranipur PP i.e. right at the 132 kV bus bar of Ranipur PP substation, cleared in 5 cycles, as normal clearing time for 132 kV i.e.100 ms, followed by a permanent trip of single 132 kV circuit emanating from this substation.

7.2 Dynamic Stability Simulations' Results with Ranipur PP in Off-Season

Faults were applied on 132 kV bus bars, followed by clearing of fault in 5 cycles (100 ms) or 9 cycles (180 ms) and then tripping of a circuit between the faulted bus and a nearby grid station. Different quantities were monitored for one second pre-fault and nine seconds after clearance of fault (post-fault) conditions and the results are plotted in Appendix – E. These fault locations and monitored quantities are discussed one by one as follows;

7.2.1

Fault Location: Three Phase Fault at Ranipur 132 kV bus bar			
Fault Duration: 5 cycles (100 ms)			
Line Tripping: Ranipur to Maharabpur 132 kV Single Circuit			
Variable	Bus/Line	Response	Figure No.
Voltage	1. Ranipur SPP 132 kV 2. Ranipur-LV 11 kV 3. Maharabpur 132 kV 4. Gambat 132 kV 5. Kandiaro 132 kV 6. Rohri-NW 132 kV	The voltages of all the bus bars recover after fault clearance	1.1
Frequency	Ranipur SPP 132 kV	Recovers after fault clearance	1.2
MW/MVAR Output of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	1.3
Speed and $P_{\text{mechanical}}$ of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	1.4
Line Flows (MW/MVAR)	Ranipur PP to Gambat 132 kV single circuit	Attains steady state value after damping of oscillations	1.5
Rotor Angles	1. Ranipur PP 11 kV 2. JDW-III-GSM 132 kV 3. Liberty 132 kV 4. Guddu 220 kV 5. Engro Energy 220 kV 6. Hub 500 kV (reference angle)	Damps down and attain a steady state value	1.6



7.2.2

Fault Location: Single Phase Fault at Ranipur SPP 132 kV bus bar			
Fault Duration: 9 cycles (180 ms)			
Line Tripping: Ranipur to Maharabpur 132 kV Single Circuit			
Variable	Bus/Line	Response	Figure No.
Voltage	1. Ranipur SPP 132 kV 2. Ranipur-LV 11 kV 3. Maharabpur 132 kV 4. Gambat 132 kV 5. Kandiaro 132 kV 6. Rohri-NW 132 kV	The voltages of all the bus bars recover after fault clearance	2.1
Frequency	Ranipur SPP 132 kV	Recovers after fault clearance	2.2
MW/MVAR Output of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	2.3
Speed and $P_{\text{mechanical}}$ of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	2.4
Line Flows (MW/MVAR)	Ranipur PP to Gambat 132 kV single circuit	Attains steady state value after damping of oscillations	2.5
Rotor Angles	1. Ranipur PP 11 kV 2. JDW-III-GSM 132 kV 3. Liberty 132 kV 4. Guddu 220 kV 5. Engro Energy 220 kV 6. Hub 500 kV (reference angle)	Damps down and attain a steady state value	2.6

7.2.3

Fault Location: Three Phase Fault at Maharabpur 132 kV bus bar			
Fault Duration: 5 cycles (100 ms)			
Line Tripping: Maharabpur to Ranipur SPP 132 kV Single Circuit			
Variable	Bus/Line	Response	Figure No.
Voltage	1. Maharabpur 132 kV 2. Ranipur SPP 132 kV 3. Ranipur-LV 11 kV 4. Kandiaro 132 kV 5. Rasulabad 132 kV 6. Tharu Shah 132 kV	The voltages of all the bus bars recover after fault clearance	3.1
Frequency	Ranipur SPP 132 kV	Recovers after fault clearance	3.2

MW/MVAR Output of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	3.3
Speed and $P_{\text{mechanical}}$ of the Plant	Ranipur PP 11 kV	Recovers after damping down oscillations	3.4
Line Flows (MW/MVAR)	Maharabpur to Kandiaro 132 kV single circuit	Attains steady state value after damping of oscillations	3.5
Rotor Angles	1. Ranipur PP 11 kV 2. JDW-III-GSM 132 kV 3. Liberty 132 kV 4. Guddu 220 kV 5. Engro Energy 220 kV 6. Hub 500 kV (reference angle)	Damps down and attain a steady state value	3.6

7.3 Conclusion of Dynamic Stability Analysis

The results of dynamic stability show that the system is very strong and stable for the proposed scheme for the severest possible faults of 132 kV systems near to and far of Ranipur PP. Therefore there is no problem of dynamic stability for interconnection of Ranipur PP; it fulfills all the criteria of dynamic stability.



8. Conclusions

- ❖ Grid Interconnection Study for 60 MW (Gross Capacity) Ranipur Energy Private Limited PP has been carried out which is located in District Khairpur, Sindh. The nearest SEPCO grid facility available for interconnection to Ranipur PP would be Gambat 132 kV Grid Station.
- ❖ Keeping in view the location of Power Project, it is proposed to connect Ranipur Energy Private Limited via looping In-Out of the existing Transmission Line from Gambat 132 kV grid station to Maharabpur 132 kV grid station. The looping distance as confirmed from site visit would be 5.11 km and the conductor used would be Lynx. The scheme is shown in Sketch-2 in Appendix-B.
- ❖ Ranipur PP would generate power at 11 kV voltage level from where it is stepped-up to 132 kV using three 132/11 kV transformers with rating of 31.5/40 MVA.
- ❖ The proposed scheme would require two 132 kV line bays at the 132 kV substation of Ranipur PP for the connection to 132 kV Gambat grid station and Maharabpur 132 kV grid station. Furthermore it would also require three transformer bays for the connection of three 132/11 kV transformers with rating of 31.5/40 MVA.
- ❖ With the gross capacity of 60 MW, the spillover from Ranipur PP would be 53.5 MW in Off-Season and 46 MW in the Crushing Season.
- ❖ In view of planned COD of Ranipur PP in April 2019, the above proposed interconnection scheme has been tested for steady state conditions through detailed load flow studies for the following scenarios:
 - Peak and Off-Peak Load Conditions of September 2019 for maximum hydropower dispatches in the grid during the Off-Season for Ranipur PP.
 - Peak Load Conditions of January 2020 for maximum thermal power dispatches in the grid during the Crushing Season for Ranipur PP.

The system conditions of normal and N-1 contingency have been studied to meet the reliability criteria of NEPRA Grid Code.

- ❖ The proposed scheme of interconnection has also been tested for the extended term scenario of peak load conditions of Summer 2022 for steady state conditions.

- ❖ Steady state analysis by load flow for all the scenarios described above reveals that the proposed scheme is adequate to evacuate the spillover of up to 53.5 MW power of the Plant under normal as well as contingency conditions.
- ❖ The short circuit analysis has been carried out to calculate maximum fault levels at Ranipur PP and the substations of 132 kV in its vicinity. We find that the fault currents for the proposed scheme are within the rated short circuit capacities of switchgear installed at these substations. There are no violations of exceeding the rating of the equipment due to contribution of fault current from Ranipur PP.
- ❖ The maximum short circuit levels of Ranipur PP 132 kV are 8.91 kA and 7.91 kA for 3-phase and 1-phase faults respectively for the year 2019. It would be advisable to go for standard size switchgear of short circuit rating of 40 kA for the 132kV substation of Ranipur PP. It would provide large margin for any future increase in short circuit levels due to future generation additions and network reinforcements in this area.
- ❖ The dynamic stability analysis of proposed scheme of interconnection has been carried out for September 2019. The stability check for the worst case of three phase fault right on the 132 kV bus bar of Ranipur PP substation followed by the final trip of one 132 kV circuit emanating from this substation, has been performed for fault clearing of 5 (100 ms) and 9 cycles (180 ms), in case of stuck breaker, as understood to be the normal fault clearing time of 132 kV protection system. The stability of system for far end faults of 3-phase occurring at 132 kV bus bar have also been checked. The proposed scheme successfully passed the dynamic stability checks for near and far faults for the most stringent cases. The system is found strong enough to stay stable and recovered with fast damping.
- ❖ The proposed scheme of interconnection has no technical constraints or problems, it fulfills all the criteria of reliability and stability under steady state load flow, contingency load flows, short circuit currents and dynamic/transient conditions; and is therefore recommended to be adopted.