



ENERGY LIMITED

RYKEL/HO/PROJ/NEPRA/02

Dated: December 05, 2016

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

Subject: Application for a new Generation License of M/s RYK Energy Limited

Dear Sir

I, Mr. Muhammad Mudassir Iqbal, Head – Energy Business being the authorized representative of M/S RYK ENERGY LIMITED by virtue of Board Resolution dated November 22, 2016, hereby apply to National Electric Power Regulatory Authority for grant of Generation license to the M/S RYK ENERGY 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.

A Bank Draft No. BBB 12481821 in the sum of Rupees PKR 294,384/- (Pak Rupees Two Hundred Ninety Four Thousand Three Hundred Eighty Four Only), 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.

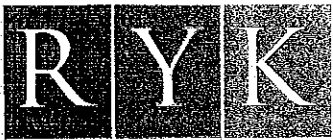
We have attached below documents in this regard along with this application:

1. Schedule I
2. Specification of additional units
3. Schedule II
4. Demand draft No. BBB 12481821 of PKR 294,384/- (Pak Rupees Two Hundred Ninety Four Thousand Three Hundred Eighty Four Only) favoring National Electric Power Regulatory Authority being Application fee for 25MW of RYK Energy Limited.
5. Copy of extended Letter Of Intent
6. Approval of Environmental and Social Soundness Assessment ("ESSA") Report from Director General, EPA, Punjab
7. Latest Audited Financials (FYE 2015-16)
8. Certificate of Incorporation and Memorandum and articles of association
9. Curriculum vitae of senior management, technical and professional staff
10. Grid Interconnectivity study report
11. Feasibility Report required under regulation 3.5(h) of NEPRA licensing regulations, 1999
12. Information of Sub-contractors
13. Prospectus
14. Infrastructure
15. Project commencement and completion schedule
16. Safety Plan
17. Emergency Plan
18. Training and Development Plan



HEAD OFFICE

75/4-D, Sarfraz Rafique Road, Lahore Cantt, Pakistan. Ph: +92-42-36601381-4
Fax: +92-42-36601385




ENERGY LIMITED

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

We request an early action in this matter.

Thanking You.

For RYK Energy Limited


Muhammad Mudassir Iqbal
Head - Energy Business



HEAD OFFICE

75/4-D, Sarfraz Rafiqi Road, Lahore Cantt, Pakistan. Ph: +92-42-36601381-4
Fax: +92-42-36601385

Account Payee Only

Allied Bank
0933 CAVALRY GROUND LAHORE

ABC No. **BBB 12481821**
Stationary/Ref No: ABC.BBB12481821

On Demand Pay NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA) A/C RYK MILLS Limited
Rupees TWO HUNDRED AND NINETY FOUR THOUSAND THREE HUNDRED AND FORTY FOUR ONLY

0	5	1	2	0
PKR ***294,384.00				

ALLIED BANKER'S CHEQUE
Payable at any branch in Pakistan

Authorized Signatory
IBS No. 6001

Authorized Signatory
IBS No. 2112

Please do not write below this line.

⑈ 12481821⑈0140000⑈0001757400010000⑈010⑈


RYK ENERGY LIMITED
Circular stamp with signature

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED IN THE MEETING OF BOARD OF DIRECTORS HELD ON 22nd NOVEMBER, 2016 AT 11:30 A.M. AT ITS REGISTERED OFFICE 74/4-D, SARFRAZ RAFIQUI ROAD, LAHORE CANTT, LAHORE.

"RESOLVED THAT" the company ("RYK Energy Limited") intends to install high pressure steam turbine having capacity of 25 MW at Janpur, Tehsil Liaqatpur, District Rahimyar Khan, Punjab Province.

"FURTHER RESOLVED THAT" Mr. Makhdum Omer Shehryar (Chief Executive Officer), Mr. Munir Hussain (Chief Financial Officer and Company Secretary), Mr. Muhammad Mudassir Iqbal (Head - Energy Business) and Mr. Qazi Fazal ur Rehman (DGM Finance) of the company, be and are hereby authorized and empowered on behalf of the company to deal with the National Electric Power Regulatory Authority ("NEPRA") and Multan Electric Power Company ("MEPCO") in connection with issuance of license, tariff and all related matters to sign and execute all the documents, and do and take all necessary acts, which may be required by NEPRA and MEPCO from time to time and to do all other incidental and ancillary acts, things and deeds.

"FURTHER RESOLVED THAT" A copy of this resolution be provided to the NEPRA and MEPCO with the seal/stamp duly affixed thereon for their information and record.


MUNIR HUSSAIN
 Company Secretary



A004854

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN

COMPANY REGISTRATION OFFICE, LAHORE

CERTIFICATE OF INCORPORATION

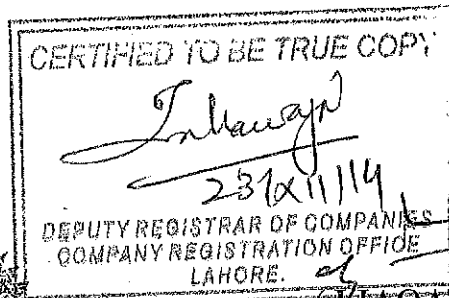
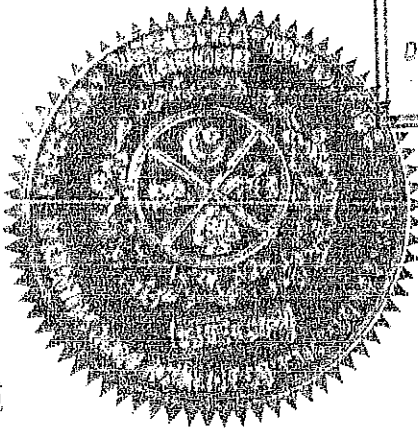
[Under section 32 of the Companies Ordinance, 1984 (XLVII of 1984)]

Corporate Universal Identification No. 0090651

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

Given under my hand at Lahore this Nineteenth day of November, Two Thousand and Fourteen.

Fee Rs. 7,000/-



(LIAQAT ALI DOLLA)
Additional Registrar of Companies

No.ARL/ 8871

DATED: 19/11/2014

RYK ENERGY LIMITED

MEMORANDUM OF ASSOCIATION

I N D E X

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THE COMPANIES ORDINANCE, 1984

COMPANY LIMITED BY SHARES

MEMORANDUM OF ASSOCIATION

OF

RYK ENERGY LIMITED

NAME

- I. The name of company is **RYK ENERGY LIMITED**

REGISTERED OFFICE

- II. The registered office of the company shall be situated in the province of the Punjab.

OBJECTS

- III. The objects for which the company is established are to undertake any or all of the following business in and outside Pakistan:

1. To generate, develop, accumulate, produce, manufacture, purchase, process, transform, distribute, transmit, sale, supply, sub-contract and / or otherwise import, export, deal in any kind of power or electrical energy using conventional and non-conventional fuel / energy sources including coal, lignite, petroleum products, bagasse, natural gas, biomass or any other substances, wind, solar, wave, tidal, hydro, thermal, agricultural residue comprising wheat husk, rice husk, cotton stalk, sugarcane trash, corn cobs, saw dust, waste from sunflower stalk, vegetable crops, lentils pulses or any other energy resources and any products or by products derived from any such business of energy and to set up power plants, wind turbine, power stations, hydel power stations, solar energy systems or any other facility to generate power and to produce, manufacture, buy, import, sale, treat, exchange, renovate, alter, modernize, install or otherwise deal in any type of machinery, equipment, implement, material, article, stores for generating, distributing, transmitting energy, including electricity and to deal with all persons including companies, government, semi government bodies for these purposes and to do all such acts, deeds and things including construction, laying down, establishing, fixing and to carry out all necessary activities for the aforesaid purposes after obtaining approval from relevant authorities.

2. To carry on the business of establishing, commissning, setting up, operating, and maintaining electric power transmission systems/networks, power systems, generating stations based on conventional/ non conventional resources for evacuation, transmission, distribution, trading or supply of power through establishing or using stations, tie-lines, sub-stations and transmission or distribution lines in any manner including build, own, transfer (BOT), and / or build, own, operate (BOO) basis or otherwise and to acquire in any manner power transmission systems / networks, power systems, generation stations, tie-lines, sub stations and transmission or distribution systems from government bodies and private sector amd to do all the ancillary, related



or connected activities as may be considered necessary or beneficial or desirable for or along with any or all of the aforesaid purposes which can be conveniently carried on these systems, networks or platform after obtaining approval from relevant authorities.

3. To design, insure, build, establish, own, operate, takeover, maintain, manage, power generation units, sub-stations, work shops, repair shops, wires, cables, transmission lines, accumulators for the purpose of conservation, distribution and supply of electricity to private and public sector companies/organizations for industrial, commercial, domestic, public and other purposes and also to provide regular services for repairing and maintenance of all distribution and supply lines subject to any permission required under the law.

4. To carry on the business of in the online value chain of Solar Energy Systems (Poly Silicon & Chemical Technology) processing, Casting. Cell manufacturing, Module manufacturing and System Installation.

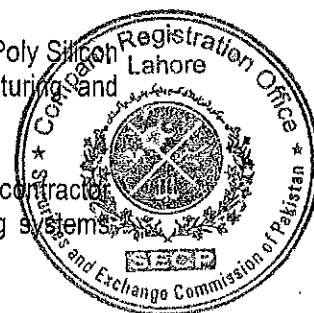
5. To carry on the business as manufacturer, exporters, importers, contractor, sub-contractor, seller buyer, agent of wind mills, components and parts including rotor blade, braking systems, towers, nacelle, control units, generator etc.

6. To carry on the business as manufacturer, exporters, importers, contractor, sub-contractor, seller buyer, agent of renewal energy systems like solar, biomass, solid waste, by product gases and gases components etc.

7. To plan, develop, establish, erect, construct, acquire, operate, run, manage, hire, take on lease, buy, sell, maintain, enlarge, alter, renovate, modernize, work and use power system networks of all types including ultra high voltage (UHV) extra high voltage (EHV), high voltage (HV), high voltage direct current (HVDC), medium voltage (MV), and low voltage (LV), lines and associated stations, substations, transmission and distribution centers, systems and net works and to lay cables, wires, accumulators, plants, motors, meters, apparatus, computers, telecommunications and telemetering, equipments and other materials connected with generators, transmission, distribution, supply and other ancillary activities relating to the electric power and to undertake for and on behalf of others all these activities in any manner

8. To install, operate, use, inspect, maintain, repair, replace, and remove cables, lines, ducts, transformers, switchgear (remotely controlled and otherwise and including time switches), fuses, circuit breakers, electricity services equipment, meters and other devices for measuring or controlling the quantity or quality of electricity supplied, prepayment and debt payment devices, items provided to afford access to, support, insulate and protect from damage or tampering, the above-mentioned gadgets, or to protect people and property from injury or damage, or to comply with any legal obligation subject to any permission required under the law.

9. To search for, obtain, acquire, buy, sell, import, export or otherwise deal in oils, gases, coal rejects, naphtha, liquefied natural gas, raw petroleum stock or any other fuel in solid, liquid or gas form, whether found in natural state or obtained by processing from other substances and to carry on the production, storage, processing and manufacturing of these product, and any related materials which may be required for the generating, transmission, distribution, trading and supply of electrical power or for meeting the requirements of any other contracts or arrangements undertaken by the company.



10. To carry on the business of electricians and electrical, mechanical engineers, suppliers of electricity for the purpose of light, heat, motive power or otherwise, and dealers in apparatus and things required for or capable of being used in connection with the generation, distribution, supply, accumulation and employment of electricity, galvanism, magnetism, or otherwise after obtaining approval from relevant authorities.

11. To plan, promote and take up necessary developmental work, selection of prospective / established independent power producers / generating transmission / distribution companies utilities and enter into contracts / Power Purchase Agreements / Other Agreements with them; to act as catalyst and also to provide connected services to them so as to augment power generation, captive consumption, transmission, distribution, optimum utilisation of electrical power and its trading.

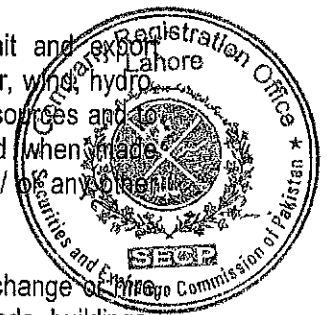
12. To execute contracts for purchase, procure, import, sell, trade, transmit and export electrical power, renewable sources and non-renewable sources of energy like solar, wind, hydro, thermal, for captive consumption whether from conventional and non conventional sources and to realise its sale proceeds and other entitlements and all other privileges as and when available by Individual, firms, bodies corporate, federal/provincial government and / or any other local bodies.

13. To own, possess, acquire by purchase, lease other rights and interest, exchange of real estate, equipment, Generating Stations and Transmission / distribution lines, lands, buildings, apartments, plants, machinery and hereditaments of any tenure or descriptions or interest therein and any right over or connected with land so situated and turn the same to account in any manner as may seem necessary or convenient for the purpose of business of the Company and to hold, improve, exploit, recognize, manage, sell, exchange or otherwise dispose of the whole or any part thereof after obtaining approval from relevant authorities.

14. To engage in the business of purchasing / procuring, selling, importing, exporting or otherwise dealing in electrical power and ancillary activities and commercial lines and to promote and organize research and development or to carry on consultancy services in the field of power generation, transmission, distribution, trading, conservation of electricity and other related activities thereto after obtaining approval from relevant authorities.

15. To buy sell, manufacture, repair, alter, improve, exchange or let out, import, export and deal in all works legally permitted, plant, machinery, engines, tanks, cylinders, valves, regulators, testing equipment, tools, utensils, appliances, cookers, stoves, heater, apparatus, materials, chemicals, natural gas, liquefied petroleum gas, fuel oil, coal, lubricants, articles and things and to manufacture, experiment with, render marketable and deal in all products legally permitted, incidental to or obtained in the business carried on by the company.

16. To apply for and obtain necessary consents, permissions and licenses from any government, provincial, local, foreign, multilateral or other authorities or entities for enabling the company to carry any of its objects into effect or for extending any of the powers of the company or for effecting any modification of the constitution of the company or for any other purpose which may seem expedient, where the company may have interests that may seem conducive to the objects of the company and to obtain from any such government, authorities or persons any rights,



privileges and concessions which the company may think fit to obtain, and to carry out, exercise and comply therewith.

17. To make petition to the appropriate authority for approval of schedule of tariff and of adjustments or increases in its bulk supply tariff where ever it is necessary..

18. To engage in reforestation and other works relating to pollution abatement and to acquire land for this purpose.

19. To apply for tender, offer, accept, purchase or otherwise acquire any contracts and concessions for or in relation to the projection, execution, carrying out, improvements, management, administrations or control of works and conveniences and undertake, execute, carry out, dispose of or otherwise turn to account the same.

20. To establish warehouses and to carry on the business of warehouse-men, stores, custodian, and to provide facilities for storage of commodities, articles, things, preparation of all kinds and description whatsoever, storage room, bins, godowns, cold storage, and clearing forwarding, transportation and distribution of merchandise of all kinds.

21. To make known or give publicity to the business and productions of the company by means of advertisement in the press, radio, television and cable television or any other electronic media, pamphlets, handbills, circulars, advertisement posters, cinema, slides, electronic media/computer device or publication of books or by donations or in any other suitable mode.

22. To purchase, take on lease or in exchange, hire, apply for or otherwise acquire, use, and hold for any interest, any rights, privileges, lands, building, easements, trade marks, patents, patent right, copyrights, licenses, machinery, plants, stock-in-trade, and any movable and immovable property of any kind necessary or convenient for the purposes of or in connection with the company's business or any branch or department thereof or otherwise turn to account any property, rights, and information so acquired, subject to any permission required under the law.

23. To enter into arrangements with the government or authority (supreme, municipal, local or otherwise) or any corporation, company, or persons that may seem conducive to the company's objects or any of them and to obtain from any such government, authority, corporation, company or person any charters, contracts, rights, privileges and commission which the company may think desirable and to carry on exercise and comply with any such charters, contracts, decrees, rights, privileges and concessions.

24. To acquire by concession, grant, purchase, barter, license either absolutely or conditionally and either solely or jointly with others any lands, buildings, machinery, plants, equipment, privileges, rights, licenses, trade marks, patents, and other movable and immovable property of any description which the company may deem necessary or which may seem to the company capable of being turned to account, subject to any permission as required under the law.

25. To establish, promote or assist in establishing or promoting and subscribe to or become a member of any other company, association or club whose objects are similar or in part similar to



the objects of this company or the establishment or promotion of which may be beneficial to the company, as permissible under the law.

26. To guarantee the performance of contracts, agreements, obligations or discharge of any debt of the company or on behalf of any associate company or person in relation to the payment of any financial facility including but not limited to loan, advance, letter of credit or other obligations through creation of all types of mortgages, charges, pledges, hypothecation, on execution of the usual banking documents / instruments or otherwise encumbrance on any or all of the movable and immovable properties of the company, either present or future or both and issuance of any other securities or sureties by any other means in favour of banks, non-banking finance companies or any financial institution and to borrow money for the purposes of the company on such terms and conditions as may be considered proper.

27. To acquire, improve, manage, develop, exchange, sell, mortgage, franchise, dispose of or deal with all or any part of the property, rights, patents and concessions of the company.

28. To arrange for local currency and foreign currency loans from banks and financial institutions for the purposes of construction or purchase of office buildings and for the purposes of working capital or for any other purpose which the directors deem fit.

29. To pay all costs, charges and expenses incidental to the formation and registration of the company.

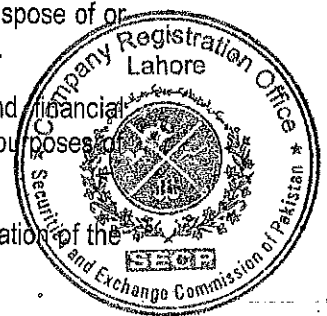
30. To sell in any manner, deal with or dispose of the undertaking or property of the company or part thereof for such consideration as the company may think fit.

31. To insure the property, assets, and employees of the company in any manner deemed fit by the company, and to create any reserve fund, sinking fund, insurance fund or any other special fund whether for depreciation or for repairing, insuring, improving, extending or maintaining any of the properties of the company or for any other purpose conducive to the interests of the company, but not to act as an insurance company.

32. To carry out joint venture agreements with other companies within the scope of the objects of the company.

33. To apply, approach, purchase, tender, auction, hold, protect, prolong, work, use or otherwise to acquire, renew or dispose of in any part of the world any patents, copyrights, trade secrets, secret processes, information, know-how, formulas, inventions, trade marks, monos, designs, licenses, concessions and the like, conferring any absolute, exclusive, non-exclusive, limited, temporary or permanent right to use or work the same or any secret or other information as 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 beneficial to the company or otherwise turn to account, the property, rights, or information so acquired, and to expend money in experimenting upon, testing or improving or seeking to improve any such patents, inventions, rights, designs or information as aforesaid which the company may acquire or propose to acquire.

34. To open, operate and close bank accounts of any type with commercial banks, authorized financial institutions, post office and government approved savings schemes and arrange for overdraft facilities against securities of company property.



35. To pay for any property or rights acquired by the company either in cash or shares or by the issue of securities or partly in one mode and partly in another and generally on such terms as may be determined.
36. To draw, make, accept, endorse, discount, execute and issue cheques, promissory notes, bills of exchange, bills of lading, warrants, debentures and other negotiable or transferable instruments but not to act as a banking company.
37. To aid and support any person, association, body or movement, whose object is to provide solution, or settlement, or to prevent any disputes, or labour problems connected with the company or with an industry, trade or business as a whole.
38. To raise or borrow money in local or foreign currency in such manner as the company shall think fit in pursuance of its objects and, in particular, by term finance certificates and by issue of securities including debentures, debenture stock and securities not based on interest for raising redeemable capital, resource funds from banks or financial institutions and to secure, if required, the repayment of any money borrowed, raised or owing by mortgage, charge, pledge, hypothecation or lien upon all or any of the property or assets of the company, both present and future, including its capital for the time being, and also by a similar mortgage, charge, pledge, hypothecation or lien to secure and guarantee the performance by the company or other associated person or associated company of any obligation undertaken by the company or any other person or company as the case may be, but not to act as a finance or banking company.
39. To arrange, manage, promote, motivate, subsidize and organize training programmes for the employees, trainees and apprentices at all levels as may be conducive to the interest of the company and for the purpose to establish training centers, to organize and hold seminars, conferences, workshops, study meetings, group discussions, written tests, lectures, practical training and other devices and for the purpose to incur recurring and non-recurring expenses as may be necessary from time to time.
40. To secure, promote, organize, manage, or enter into collaboration agreement in all its branches with any person, firm, company, corporation, authority, body or other entity to acquire technical know-how, buy back arrangement, procurement of any nature of goods, training and development or for any other purpose whatsoever and subject to the law in force pay such commission, fees, royalty or other charges as may be agreed from time to time.
41. To incorporate, float, promote, constitute or form any subsidiary company or companies or to make any existing company as the subsidiary of the company for the purpose of carrying on any business or branch of a business which the company is authorized to carry on or not, and to enter into any arrangement with such subsidiary company for sharing profits and losses of any business or branch of business as carried on, or to make any other arrangement which may seem conducive with reference to any business so carried on, including power at any time to close any such branch or business.
42. To establish and maintain or procure the establishment and maintenance of any contributory or non-contributory funds for the benefit of, and give or procure the giving of donations, gratuities, pensions, allowances or emoluments to such persons who are or were at any time in the employment or service of the company or of any company which is a holding company,



management company or a subsidiary of the company or is allied to or associated with the company or with any such subsidiary or affiliate company, or who are or were at any time directors or officers of the company or of any such other company as aforesaid, and the wives, widows, families and qualified dependents of any such persons, and also to establish, subsidize and subscribe to institutions, associations, clubs or funds calculated to be for the benefit of or to advance the interests and well-being of the company or of any such other company as aforesaid, and make payments to or towards the insurance of any such person as aforesaid and do any of the matters aforesaid, either alone or in conjunction with any such other company as aforesaid.

43. To undertake, carry out, promote, sponsor, discharge, fulfill or assist all types of activities considered to be the social or moral responsibilities of the company to community, class of peoples, section of public or to public at large including activities for promotion of education, national welfare, economic growth, increase in standard of living, uplifting moral public, etc. by organizing seminars and lectures, publishing books and literature, distributing awards and scholarships, providing subsidies and donations to such persons or bodies on such terms and conditions as the board of directors of the company may think fit from time to time.

44. To acquire and hold of investments in shares, modaraba certificates, term finance certificates, musharika certificates, unit trust certificates, mutual fund certificates, debentures, debenture stock, bonds, obligations and securities issued or guaranteed by any company, government, commission, public body or authority, supreme, municipal, local or otherwise and to dispose of investments as and when required or at the time of winding up of the company subject to any permission required by the law but not to act as a finance / investment company or brokerage house.

45. To accept shares, modaraba certificates, term finance certificates, musharika certificates, bonds, debentures or other securities of any other company in payment or part payment of any services rendered or for any sale made to or debt owing from any such company, subject to any permission required by the law.

46. To acquire, take over and undertake the whole or any part of business as a going concern along with all assets, liabilities, licenses, quotas, rights, entitlements etc. from any person, firm or company; to enter into partnership or into any arrangements for sharing profits, union of interests, co-operations, joint ventures, reciprocal concessions or otherwise with any person or company carrying on or engaged in, or about to carry on or engage in, any business or transaction which this company is authorized to carry on or engage in or any business or transaction capable of being conducted so as to directly or indirectly benefit this company and to guarantee the contracts of or otherwise assist any such person or company and to take or otherwise acquire shares and securities of any such company and to sell, hold, re-issue, with or without guarantee or otherwise deal with the same.

47. To procure the company to be registered or recognized in any part of the world and to do all or any of the above things in any part of the world, either as principal, agent, trustee, contractor or otherwise, alone or in collaboration with another, and either by or through agents, trustees, sub-contractors, subsidiaries or otherwise.



48. To give any director, official, servant or employee of the company commission in the profits of the company's business or any branch thereof and for the purpose to enter into any agreement or scheme of arrangement as the company may deem fit and to procure any servants or employees of the company to be insured against the risk of accident in the course of their employment by the company.

49. To give charity and donations to any person, charitable institutions and other organizations as the directors of the company deemed fit.

50. To amalgamate, absorb or merge with any company or companies, firm or firms, association of persons, foreign company or association or body, whether or not having similar objects as of this company and to do all such incidental act, deeds and things as may be necessary to give effect to amalgamation, absorption or merger.

51. To advance money to staff members, customers and others having dealing with the company with or without security upon such terms as may deem expedient.

52. To sell, mortgage or dispose of the undertaking of the company or any part thereof in such manner and for such consideration as the company may think fit.

53. To distribute any of the company's property among the members in specie or in any manner whatsoever in the event of winding up of the company.

54. To do all such other things as are incidental or conducive in the opinion of the board of directors, to the attainment of the above sole object.

55. To undertake or execute any trust the undertaking of which seem to the company desirable, either gratuitously or otherwise.

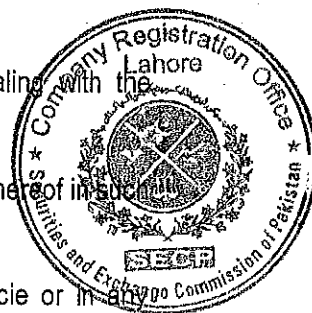
56. To apply for and obtain necessary consents, permissions and licenses from any government, state, local and other authorities for enabling the company to carry on any of its objects into effect as and when required by law.

57. It is declared that notwithstanding anything contained in the foregoing object clauses of the memorandum of association nothing contained therein shall be constructed as empowering the company to undertake or indulge in business of banking company, banking, leasing, investment, managing agency or insurance business directly or indirectly as restricted under the law or any unlawful operation. Further that the company shall not launch multilevel marketing, pyramid and ponzi schemes.

58. It is further declared that 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.

LIABILITY OF MEMBERS

IV. The liability of the members is limited.



SHARE CAPITAL

- V. The authorized share capital of the company is Rupees 1,000,000 (Rupees One Million) divided in to 100,000 (One Hundred Thousand) shares of Rupees 10 (Rupees Ten) each comprising ordinary shares and preference shares with the power to increase or reduce the capital and to divide the shares in the capital for the time being into several classes in accordance with the provisions of the Companies Ordinance 1984 and rules made there under and to attach thereto respectively such preferential, deferred, qualified or special rights, privileges or conditions as may be determined by or in accordance with the articles of association or the regulations of the company for the time being and to vary, modify, abrogate any such rights, privileges or conditions in such manner as may for the time being be provided by the articles of association or regulations of the company.



We, the several persons whose names and addresses are subscribed below, are desirous of being named in a Company in pursuance of this Memorandum of Association and we respectively agree to take the number of shares in the capital of the company set opposite our respective names:-

Sr. No.	Name & Surname (Present and former in full)	Father's/Husband's Name in full	Nationality	Occupation	Residential Address	No. of ordinary shares taken by each Subscriber	Signature
1	Mrs. Naseem Javaid CNIC # 35202-5643424-0	W/o Mr. M. Sadiq Javed	Pakistani	Business Executive	H. No. 5-Q/A, Gulberg II, Lahore	500	
2	Makhdum Omar Sheryar CNIC # 42301-9725732-7	Makhdum Rukan- ud-Din	Pakistani	Business Executive	117/2/1, Khayabane-e-Bukhari DHA-VI, Karachi	500	
3	Mrs. Tehmina Sadiq Javaid CNIC # 42301-3018474-8	W/o Makhdum Omar Sheryar	Pakistani	Business Executive	117/2/1, Khayabane-e-Bukhari DHA-VI, Karachi	500	
4	Mrs. Bilqees Fatima CNIC # 35202-2265560-8	W/o Mr. Munir Hussain	Pakistani	Business Executive	178-Nishtar Block, Allama Iqbal Town, Lahore	500	
5	Mr. Munir Hussain CNIC # 35202-2570641-7	Mr. Nazir Hussain	Pakistani	Business Executive	178-Nishtar Block, Allama Iqbal Town, Lahore	500	
6	Mrs. Riffat Zamani CNIC # 31303-7349097-2	W/o Makhdum Rukan-ud-Din	Pakistani	Business Executive	Minwali Qureshian, P.O.Khas, Distt. And Tehsil Rahim Yar Khan	500	
Total Shares Taken						3000	

Dated this 14 day of October, 2014

Witness to the above Signatures:

Full Name: NIFT (PRIVATE) LIMITED

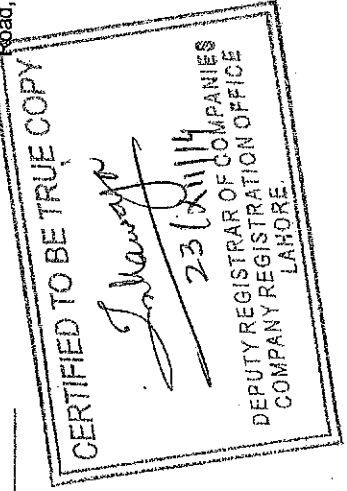
Father's/Husband's Full Name:

Nationality: Pakistani

Occupation

Signature:

Full Address: 5th floor, AWT Plaza, I.I. Chundrigar
Road, Karachi 74200



RYK ENERGY LIMITED

ARTICLES OF ASSOCIATION

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THE COMPANIES ORDINANCE, 1984

ARTICLES OF ASSOCIATION

OF

RYK ENERGY LIMITED



I. PRELIMINARY

1. TABLE "A" Not to Apply

The regulations in Table 'A' in the First Schedule to the Companies Ordinance, 1984 shall not apply to the company except so far as the same are repeated or contained in these articles. Moreover, any clause of articles of association if found contrary to the provisions of the Companies Ordinance, 1984 (Ordinance) the provisions of Ordinance will prevail.

2. DEFINITIONS

Unless the context otherwise requires, the terms used in these articles shall have the meanings set out below:

- (a) **"Articles"** mean these articles of association of the company as originally framed or as from time to time altered in accordance with the law.
- (b) **"Board"** means the group of directors in a meeting duly called and constituted or, as the case may be, the directors assembled at a board.
- (c) **"Book and paper"**, "book or paper" or "books of account" mean accounts, deeds, vouchers, writings and documents, maintained on paper or computer network, floppy, diskette, magnetic cartridge tape, CD-Rom or any other computer readable media;
- (d) **"Buy-Back of Shares Rules and Regulations"** mean the Companies (Buy-Back of Shares) Rules, 1999 and the Companies (Buy-Back of Shares) Regulations or any modification or enactment thereof.
- (e) **"Company"** means RYK Energy Limited.
- (f) **"Commission"** means the Securities and Exchange Commission of Pakistan established under section 3 of the Securities and Exchange Commission of Pakistan Act, 1997.
- (g) **"Directors"** mean the directors for the time being of the company including alternate directors and, subsequently elected pursuant to Companies Ordinance, 1984 or as the case may be, the directors assembled at a board.
- (h) **"Dividend"** includes cash dividend, dividend in species and bonus shares.

- (i) **"Electronic"** includes electrical, digital, magnetic, optical, bio-metric, electro-chemical, wireless or electromagnetic technology.
- (j) **"Electronic Transactions Ordinance"** means the Electronic Transactions Ordinance, 2002 or any modification or re-enactment thereof.
- (k) **"In Person"** includes attendance and/or voting at a meeting, personally or by video or telephone-conference or other facility whereby all the participants of the meeting can hear and / or see each other unless expressly stated otherwise by the directors.
- (l) **"Instrument of Transfer"** includes transfer deeds
- (m) **"Member"** means a person whose name is for the time being entered in the register of members by virtue of his being a subscriber to the Memorandum of Association of the company or of his holding by allotment or otherwise any share, scrip or other security which gives him a voting right in the company.
- (n) **"Memorandum"** means the Memorandum of the company as originally framed or as from time to time altered in accordance with law.
- (o) **"Month"** means calendar month according to the English calendar.
- (p) **"Office"** means the registered office for the time being of the company.
- (q) **"Ordinance"** means the Companies Ordinance, 1984 or any modification or re-enactment thereof for the time being in force.
- (r) **"Preference Shares"** not being ordinary shares mean preference shares whether redeemable or irredeemable, participatory or non-participatory, convertible or non-convertible, cumulative or otherwise with the rights, privileges and conditions attaching thereto as are provided by the articles.
- (s) **"Preference Shareholders"** not being ordinary shareholders mean, in relation to the company, every person to whom the company has allotted, or who becomes the holder of such shares and whose name is entered in the register of members.
- (t) **"Proxy"** includes an attorney duly constituted under a power of attorney.
- (u) **"Record"** includes, in addition to a written or printed form, any disc, tape, sound-track, film or other device in which sounds and / or other data is embodied so as to be capable (with or without the aid of some other instrument or machine) of being reproduced therefrom in audible, legible or visual form.
- (v) **"Register"** means, unless the context otherwise requires, the register of members and include the register of debenture-holders or holders of other securities maintained on paper or computer network, floppy, diskette, magnetic cartridge tape, CD-Rom or any other computer readable media; to be kept pursuant to provisions of the ordinance.
- (w) **"Registrar"** means a Registrar, defined in section 2 (1) (31), performing the duty of registration of companies under the ordinance.



- (x) **"Regulations"** mean the rules of governance of the company made by the board from time to time.
- (y) **"Seal"** means the common or official seal of the company.
- (z) **"Section"** means section of the ordinance.
- (aa) **"Sign" and "Signature"** unless otherwise provided in these articles, include respectively lithography, printing facsimile, "advanced electronic signature" which is capable of establishing the authenticity and integrity of an electronic document, as defined by section 2(e) of the Electronic Transactions Ordinance, and names impressed with a rubber or other kind of stamp.
- (ab) **"Special Resolution"** means the special resolution of the company as defined in section 2(1)(36) of the ordinance.

3. Interpretation

In these articles, unless the context otherwise requires:

- (a) the singular includes the plural and vice versa and words denoting any gender shall include all genders;
- (b) references to any act, ordinance, legislation, rules or regulations or any provision of the same shall be a reference to that act, ordinance, legislation, rules or regulations or provisions, as amended, re-promulgated or superseded from time to time;
- (c) the terms "include" or "including" shall mean include or including without limitation;
- (d) expressions referring to writing shall, unless the contrary intention appears, be construed as including references to printing, lithography, photography, and other modes of representing or reproducing words in a visible form, including but not limited to, electronic transmission such as facsimile, and electronic mail or any other electronic process, as prescribed by the provisions of the Electronic Transactions Ordinance.
- (e) words importing persons shall include bodies corporate; and
- (f) words and expressions contained in these articles shall bear the same meaning as in the ordinance.

REGISTERED OFFICE

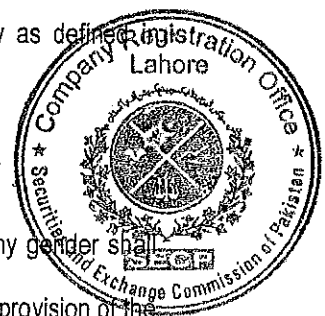
- 4. The Registered office of the company shall be in the Province of Punjab as the directors shall from time to time appoint.

PUBLIC LIMITED COMPANY

- 5. The company is a public limited company within the meanings of section 2(1), Clause (30) of the Companies Ordinance, 1984.

BUSINESS

- 6. All branches or kind of business which the company is either expressly or by implication authorised to undertake may be undertaken by the directors at such time or times as they shall think fit,



and further may be allowed by them to be in abeyance, whether such branch or kind of business may have been actually commenced or not, so long as the directors may deem it expedient not to commence or proceed with such branch or kind of business.

II. CAPITAL

SHARES

7. The authorized share capital of the company is Rupees 1,000,000 (Rupees One Million only) divided in to 100,000 (One Hundred Thousand) shares of Rupees 10 (Rupees Ten) each comprising ordinary shares and preference shares with the power to increase or reduce the capital and to divide the shares in the capital for the time being into several classes in accordance with the provisions of the Companies Ordinance 1984 and rules made there under and to attach thereto respectively such preferential, deferred, qualified or special rights, privileges or conditions as may be determined by or in accordance with the articles of association or the regulations of the company for the time being and to vary, modify, abrogate any such rights, privileges or conditions in such manner as may for the time being be provided by the articles of association or regulations of the company.

8. Subject to provisions of the ordinance and any rules in that regard made under the ordinance and without prejudice to any special rights previously conferred on the holders of any existing shares of one class of shares, any share in the company may be issued with different rights, restrictions, and privileges, including but not limited to the following as may be approved by the company by special resolution:

- (1) different voting rights; voting rights disproportionate to the paid-up value of share held; voting rights for specific purposes only; or no voting rights at all;
- (2) different rights for entitlement of dividend, right shares or bonus shares or entitlement to receive the notices and to attend the general meetings;
- (3) rights and privileges for indefinite period, for a limited specified period or for such periods as may from time to time be determined by the company; and
- (4) different manner and mode of redemption, including redemption in accordance with the provisions of these articles, subject to provisions of the ordinance, including but not limited to, by way of conversion into shares with such rights and privileges as determined by the company in the manner and mode provided in these articles.

9. The minimum subscription upon which the company may proceed to allot shares shall be Rupees 400,000 (Rupees Four Hundred Thousand).

10. Subject to provisions of the ordinance and any rules in that regard made under the ordinance, the company may issue shares which are to be redeemed or any other redeemable security, on such terms and in such manner as may be provided in the said section and rules.

11. Subject to provisions of the ordinance and these articles and subject to any special rights or privileges for the time being attached to any issued shares, the shares in the capital of the company for the time being, including any new shares resulting from an increase in the authorized capital, shall be under the control of the directors who may allot or otherwise dispose of the same or any of them to such persons, on such terms and conditions, and with such rights and privileges annexed thereto as the resolution creating the same shall direct, and if no direction be given, as the directors shall determine and at such times and in such manner as the directors think fit, either at par or at a premium or subject



to provisions of the ordinance at a discount, with power to the directors to give any person the right to call for and be allotted shares of any class of the company at par or at a premium or, subject as aforesaid, at a discount, such option being exercisable at such time, and for such consideration as the directors think fit. Provided that the shares in the capital of the company shall always be issued as fully paid shares and no shares shall be issued as partly paid shares. The directors shall, as regards any allotment of shares, duly comply with such of the provisions.

12. The directors may allot and issue shares in the capital of the company as payment or part payment for any property sold or transferred, or for services rendered, to the company in the ordinary course of its business, and shares so allotted shall be issued as and shall be deemed to be fully paid shares.

13. The board shall, as regards any allotment of shares, duly comply with such provisions of the ordinance as may be applicable.

14. The company may at any time pay a commission to any person for subscribing or agreeing to subscribe (whether absolutely or conditionally) for any shares, debentures or debenture stock in the company or procuring or agreeing to procure subscriptions (whether absolutely or conditionally) for any shares, debentures or debenture stock in the company; provided, that, if the commission in respect of shares shall be paid or payable out of capital, the statutory requirements and conditions shall be observed and complied with, and the amount or rate of commission shall not exceed such percentage on the shares, debentures or debenture stock in each case subscribed or to be subscribed, as may be determined by the board subject to any limits required by law. The commission may be paid or satisfied, either wholly or partly, in cash or in shares, debentures or debenture stock. The company may also on any issue of shares pay such brokerage fees as may be lawful; Provided that such brokerage fees shall not exceed such percentage of the shares, debentures or debenture stock paid-up as may be determined by the board, subject to any limits required by law.

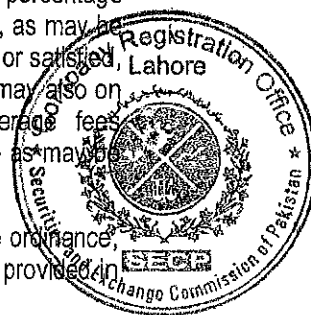
15. Subject to provisions of the ordinance and any rules in that regard made under the ordinance, the company may purchase its own shares on such terms and in such manner as may be provided in the ordinance.

16. Except as permitted in the ordinance and any rules in that regard made under the ordinance, no part of the funds of the company shall be employed in the purchase of its own shares or in giving, whether directly or indirectly and whether by means of a loan, guarantee, security or otherwise, any financial assistance for the purpose of or in connection with a purchase made or to be made by any person of or any shares in the company.

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

18. Shares may be registered in the name of persons, any limited company or other corporate body. Not more than four persons shall be registered as joint-holders of any share.

19. If any share or shares stand 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 notices and all or any other matters connected with the company except voting at the meeting and the transfer of shares, be deemed the sole holder.



RIGHTS PRIVILEGES AND CONDITIONS ATTACHED TO SHARES

20. As regards income, the profits which the company may determine to distribute in respect of any financial year or other period for which the accounts shall be made up, shall be applied in the following order of priority;

- (1) In paying the holders of the preference shares, the rights to a preferential dividend, cumulative or non cumulative, as determined by the board on the capital paid up thereon payable as regards each financial year out of the profits of the company resolved to be distributed in respect of that year, but shall not be entitled to any further participation in profits; and
- (2) Subject to the rights of any class of shares for the time being issued, in distributing the balance amongst the holders of the ordinary shares according to the amounts paid up on the ordinary shares held by them respectively.

21. As regards conversion, the company may partly or wholly convert the preference shares at the option of the holders of the preference shares to be converted in accordance, respectively, with the terms and conditions of their issue.

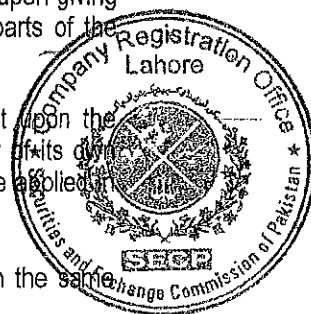
22. As regards redemption, subject to provisions of the ordinance, the company may, upon giving the holders of the shares to be redeemed notice in writing, redeem the whole or any parts of the preference shares in accordance, respectively, with the terms and conditions of their issue.

23. As regards capital, on a return of capital in a winding up or otherwise (except upon the redemption of shares of any class of preference shares or the purchase by the company of its own shares), the surplus assets of the company remaining after payment of its liabilities shall be applied in the following order of priority:

- (1) in paying to the holders of the preference shares, the capital paid up on the same without any further right to participate in profits or assets; and
- (2) subject to the rights of any other class of shares for the time being issued, in distributing the balance amongst the holders of the ordinary shares according to the amounts paid up on the ordinary shares held by them respectively.

24. As regards entitlement to bonus or right shares, the holders of preference shares shall not be entitled to bonus or right shares in the event that the company, increases its ordinary share capital by the issue of further shares or otherwise.

25. As regards voting rights, the holders of the preference shares shall not be entitled to receive notice of, attend, or vote at, any general meeting of the company, except as otherwise provided by the ordinance, whereby the holders of such shares would be entitled to vote separately as a class, that is, with respect to voting entitlement of the preference shareholders on matters affecting, respectively, their substantive rights and liabilities. Without prejudices to the foregoing, the holders of preference shares may attend the general meeting of the company as observers with prior permission of the Chairman of the meeting.



CERTIFICATES

26. The certificates of title to shares and duplicate thereof shall be issued under the seal of the company and signed by two of the directors or by one such director and the secretary provided that such signatures may if necessary be printed lithographed or stamped subject to the approval of the directors.

27. Every member shall be entitled to one certificate for all the shares registered in his name, or, if the directors so approve, to several certificates each for one or more of such shares, but in respect of each certificate for less than one hundred shares, the directors shall be entitled to charge a fee of Rupees 10 or such lesser sum as they may determine. Every certificate of shares shall specify the number and denoting numbers of the shares in respect of which it is issued.

28. The company shall within ninety days after the allotment of any shares, debentures or debenture stock and within forty-five days after receipt by the company of the application for transfer of any such shares, debentures or debenture stock complete and have ready for delivery the certificate of all shares, the debentures and the certificate of all debenture stock allotted or transferred, and unless sent by post or delivered to the person entitled thereto within the period aforesaid the company shall immediately thereafter give notice to that person in the manner prescribed in these articles for the giving of notices to members that the certificate is ready for delivery.

29. If a certificate of shares, debenture or debenture stock is proved to the satisfaction of the company to have been lost or destroyed or, being defaced or mutilated or torn, is surrendered to the company, and the company is requested to issue a new certificate in replacement thereof, the company shall, after making such enquiry as it may deem fit, advise the applicant within thirty days from the date of application the terms and conditions (as to indemnity and otherwise and as to payment of the actual expenses incurred on such enquiry and of a fee not exceeding ten rupees) on which the company is prepared to issue a new certificate and a time for compliance therewith or of the reasons why the company is unable to issue a new certificate, as the case may be, and in the former case if the applicant shall within the time allowed comply with the terms and conditions specified, the company shall issue a new certificate to the applicant within forty five days from the date of application.

30. The company shall not be bound to issue more than one certificate in respect of a share or shares held jointly by two or more persons and delivery of a certificate for a share to any one of joint holders shall be sufficient delivery to all.

TRANSFER AND TRANSMISSION

31. (1) The directors shall not refuse to register the transfer of fully paid shares unless the instrument of transfer is defective or invalid or is not accompanied by the certificate of the share(s) to which it relates. The directors may also decline to recognise any instrument of transfer unless it is accompanied, in addition to the certificate of the shares to which it relates, by such other evidence as the directors may reasonably require to show the right of the transferor to make the transfer. The directors may waive the production of any certificate upon evidence satisfactory on them of its loss or destruction.
- (2) If the directors refuse to register a transfer of any shares they shall, within thirty (30) days after the date on which the instrument of transfer was lodged with the company, send to the transferee and the transferor notice of the refusal indicating the reason for such refusal; provided that if the directors refuse to register a transfer of shares on

account of a defect in or the invalidity of the instrument of transfer, the transferee shall be entitled, after removal of such defect or invalidity, to re-lodge the instrument of transfer with the company.

32. The instrument of transfer of any share shall be in writing in the usual common form, or in the following form, or as near thereto as circumstances will admit:

Folio No. _____
Certificate No. _____

TRANSFER DEED

RYK ENERGY LIMITED

I/We, _____ of _____ in consideration of the sum of Rupees _____ paid to me/us by _____ of _____ hereinafter called the transferee(s), do hereby transfer to the said transferee(s) the ** ** Ordinary/Preference Shares numbered _____ to _____ inclusive, in my/our name in the books of **RYK Energy Limited** to hold unto the said transferee(s), his/her/their executors, administrators and assigns, subject to the several conditions on which I/we hold the same at the time of the execution hereof, and I/we, the said transferee(s) do hereby agree to accept and take the said shares subject to the same conditions.

As witness our hands the _____ day of _____.

Signed by the above named transferor in the presence of: -

Transferor's
Seller's
NIC#

Signature

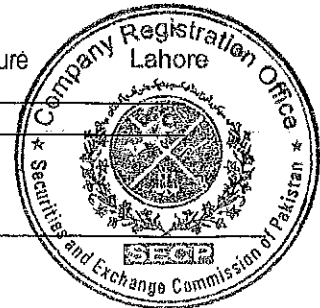
Witness

NIC #

Occupation

Address

Address



Signed by the above named transferee in the presence of: -

Transferee's
Buyer's
NIC #
Occupation

Signature

Witness

NIC #

Occupation

Address

Address

33. No transfer shall be made to a minor or person of unsound mind.

34. All registered instruments of transfer shall be retained by the company, but any instrument of transfer which the directors may decline to register shall be returned to the person depositing the same.

35. The instrument of transfer of any share in the company shall be duly stamped and executed both by the transferor and transferee, and the transferor shall be deemed to remain holder of the share(s) until the name of the transferee is entered in the register in respect thereof.

36. On giving seven days previous notice in the manner provided in the ordinance and articles, the transfer books and register may be closed during such time as the directors think fit, not exceeding in the whole forty-five days in each year, but not exceeding thirty days at a time.

37. The executors or administrators or the nominee appointed under provisions of the ordinance of a deceased member (not being one of several joint-holders) shall be the only persons recognised by the company as having any title to the shares registered in the name of such member, and in case of the death of any one or more of the joint-holders of all registered shares, the survivors shall be the only persons, recognised by the company as having any title to or interest in such shares, but nothing herein contained shall be taken to release the estate of a deceased joint-holder from any liability on shares held by him jointly with any other person. Before recognising any executor or administrator, the directors may require him to obtain a Grant of Probate or nomination as mentioned above or Letters of Administration or other legal representation, as the case may be, from some competent Court in Pakistan having effect in Lahore. Provided nevertheless that in any case where the board in their absolute discretion think fit, it shall be lawful for the directors to dispense with the production of Probate or Letters of Administration or such other legal representation upon such terms as to indemnity or otherwise as the directors, in their absolute discretion, may consider necessary.

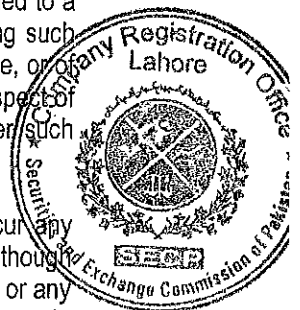
38. Any committee or guardian of a lunatic or minor member or any person becoming entitled to a share in consequence of the death or bankruptcy or insolvency of any member upon producing such evidence that he sustains the characters in respect of which he proposes to act under this article, or of his title, as the directors think sufficient, shall have the right to be registered as a member in respect of such share, or may, subject to the regulations as to transfer hereinbefore contained, transfer such share.

39. Neither the company nor the directors nor any other officer of the company shall incur any liability for registering or acting upon a transfer of shares apparently made by sufficient parties, although the same may, by reason of any fraud or other cause not known to the company or the directors or any other officer of the company, as aforesaid, be legally inoperative or insufficient to pass the property in the shares proposed or professed to be transferred, and although the transfer may, as between the transferor and transferee, be liable to be set aside, and, notwithstanding that the company may have notice that such instrument of transfer was signed or executed and delivered by the transferor in blank as to the name of the transferee or the particulars of the shares transferred, or otherwise in defective manner. And in every such case the person registered as transferee, his executors, administrators and assigns alone shall be entitled to be recognised as the holder of such shares and the previous holder shall, so far as the company is concerned, be deemed to have transferred his whole title hereto.

ALTERATION OF CAPITAL

40. The company may by ordinary resolution and subject to compliance with the requirements of provisions of the ordinance

- (a) increase the authorized share capital by such sum, to be divided into shares of such amount, as the resolution shall prescribe.
- (b) consolidate and divide its share capital into shares of larger amount than its existing shares;
- (c) by sub-division of its existing shares or any of them, divide the whole or any part of its share capital into shares of smaller amount than is fixed by the memorandum of association;



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

41. The directors may from time to time increase the issued share capital by such sum as they think fit. Except as otherwise permitted by provisions of the ordinance, and subject to any special rights or privileges for the time being attached to any issued shares, all shares intended to be issued by the directors shall, before issue, be offered to the members strictly in proportion to the amount of the issued shares held by each member (Irrespective of class); provided that fractional shares shall not be offered and all fractions less than a share shall be consolidated and disposed of by the company and the proceeds from such disposition shall be paid to such of the entitled members as may have accepted such offer. Such offer shall be made by notice specifying the number of shares offered, and limiting a time within which the offer, if not accepted, will be deemed to be declined, and after the expiration of that time, or on the receipt of an intimation from the person to whom the offer is made that he declines to accept the shares offered, the directors may dispose of the same in such manner as they think fit. In respect of each such offer of shares the directors shall comply with the provisions of provisions of the ordinance. Any difficulty in the apportionment of shares amongst the members, such difficulty shall, in the absence of any directions given by the company in general meeting, be determined by the directors.

42. Except so far as otherwise provided by the conditions of issue or by these articles, any capital raised by the creation of new shares shall be considered part of the original capital and shall be subject to the provisions herein contained with reference to transfer and transmission and otherwise.

43. Subject to the provisions of the ordinance, if, owing to any inequality in the number of new shares to be issued and the number of shares held by a member entitled to have the offer of such new shares, any difficulty shall arise in the apportionment of such new shares or any of them amongst the members, such difficulty shall, in the absence of any direction in the resolution creating the shares of the company in general meeting, be determined by the directors.

44. The company may, by special resolution, reduce its share capital in any manner, with and subject to, any incident authorized and consent required by law.

45. The share premium account maintained pursuant to provisions of the ordinance may be applied by the company:

- (a) in writing off the preliminary expenses of the company;
- (b) in writing off the expenses of, or the commission paid or discount allowed on, any issue of shares or debentures of the company;
- (c) in providing for the premium payable on the redemption to any redeemable preference shares or debentures of the company; or
- (d) in paying up un-issued shares of the company to be issued as fully paid bonus shares.

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



VARIATION OF SHAREHOLDERS' RIGHTS

47. Whenever the capital is divided into different classes of shares, all or any of the rights and privileges attached to each class may, subject to the provisions of the ordinance, be modified, commuted, affected, abrogated or dealt with by agreement between the company and any person purporting to contract on behalf of that class provided such agreement is (a) ratified in writing by the holders of at least three-fourths in nominal value of the issued shares of the class or (b) confirmed by a special resolution passed at an extraordinary general meeting of the holders of shares of that class and all the provisions hereinafter contained as to general meetings, shall, mutatis mutandis, apply to every such meeting. This article shall not by implication curtail the power of modification which the company would have if this article were omitted.

III. MEETINGS

CONVENING OF GENERAL MEETINGS

48. The statutory meeting of the company shall be held within the period required by provisions of the Companies Ordinance 1984.

49. Except as may be allowed under the provisions of the ordinance, the company shall hold a general meeting once at least in every calendar year within a period of four months following the close of its financial year in the town in which the office is situate and at such time and place as may be determined by the directors, provided that no greater interval than fifteen months shall be allowed to elapse between two such general meetings. The company may, for any special reason and with permission of the Commission, extend the time within which any annual general meeting, not being the first such meeting, shall be held.

50. The company shall hold its annual general meeting in the town in which the registered office is situate; provided that, it may, for any special reason and with permission of the Commission, hold the said meeting at any other place. Save as aforesaid, the company may hold its general meeting at one or more venues using any technology that gives the members as a whole a reasonable opportunity to participate in the meetings.

51. All general meetings of the company, other than the statutory meeting or any annual general meeting, shall be called extraordinary general meetings.

52. The directors may, whenever they think fit, and they shall, on the requisition of the holders of not less than one-tenth of the issued capital of the company, forthwith proceed to convene an extraordinary general meeting of the company. If at any time there are not within Pakistan sufficient directors capable of acting to form a quorum, any director of the company may call an extraordinary general meeting in the same manner as nearly as possible as that in which meetings may be called by the directors, and in the case of such requisition the following provisions shall have effect:

- (1) The requisition must state the objects of the meeting and must be signed by the requisitionists and deposited at the office and may consist of several documents in like form each signed by one or more requisitionists.
- (2) If the directors do not proceed within twenty-one days from the date of the requisition being so deposited to cause a meeting to be called, the requisitionists or a majority of them in value may themselves convene the meeting, but any meeting so convened shall not be held after three months from the date of the deposit.

- (3) Any meeting convened under this article by the requisitionists shall be convened in the same manner as nearly as possible as that in which meetings are to be convened by the directors but shall be held at the office.
- (4) A requisition by joint-holders of shares must be signed by all such holders.
53. (1) Notice of a general meeting shall be sent in the manner hereinafter mentioned at least twenty one (21) days before the date on which the meeting is to be convened to all such persons as are under these articles or the ordinance entitled to receive such notices from the company and shall specify the place and the day and hour of the meeting and the nature of the business to be transacted thereat.
- (2) In the case of an emergency affecting the business of the company, an extraordinary general meeting may be convened by such shorter notice than that specified in these articles as the Registrar may authorise.
- (3) Where any special business, that is to say, business other than consideration of the accounts, balance sheet and the reports of the directors and auditors, the declaration of dividend, the appointment and fixation of the remuneration of auditors and, where the notice convening the meeting provides for the election of directors, the election of directors (all such matters being herein referred to as ordinary business) is to be transacted at a general meeting, there shall be annexed to the notice of such meeting a statement setting out all such facts as may be material for the consideration of such business including the nature and extent of the interest (whether direct or indirect) of any director, and where the item of business involves approval of any document, the time and place appointed for inspection thereof, and to the extent applicable. Such statement shall be annexed to the notice also in the case of ordinary business to be transacted at the meeting.
- (4) Where a resolution is intended to be proposed for consideration at a general meeting in some special or particular form, a copy thereof shall be annexed to the notice convening such meeting.
- (5) If a special resolution is intended to be passed at a general meeting, the notice convening that meeting shall specify the intention to propose the resolution as a special resolution.
- (6) A notice for a general meeting at which an election of directors is to take place shall state the number of directors to be elected at that meeting and the names of the retiring directors.
- (7) The notice of every general meeting shall prominently specify that a proxy may be appointed who shall have the right to attend, demand or join in demanding a poll and vote on a poll and speak at the meeting in the place of the member appointing him and shall be accompanied by a form of proxy acceptable to the company.
- (8) The company shall comply with the provisions of the ordinance with regard to giving notices of general meetings.
54. The accidental omission to give any such notice to or the non-receipt of notice by any of the members shall not invalidate the proceedings at any such meeting.

PROCEEDINGS AT GENERAL MEETINGS

55. No business shall be transacted at any general meeting unless a quorum of members is present at the time when the meeting proceeds to business; save as herein otherwise, provided two (2) members present in person or by proxy representing twenty five percent (25%) of the total voting power either of their own account or as proxies shall be a quorum.

56. The Chairman of the board of directors shall preside as Chairman at every general meeting of the company, or if there is no such Chairman, or if he shall not be present in person within fifteen minutes after the time appointed for the holding of the meeting or is unwilling to act, the Chief Executive shall preside as Chairman of the meeting, or if the Chief Executive is absent or unwilling to act, any one of the directors present in person may be elected to be Chairman of the meeting, or if no director be present in person, or if all the directors present in person decline to take the chair, the members present in person shall choose one of their member to be Chairman of the meeting.

57. If within half-an-hour from the time appointed for the meeting, a quorum is not present, the meeting if convened upon such requisition as aforesaid shall be dissolved, but 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 it, the meeting shall be dissolved.

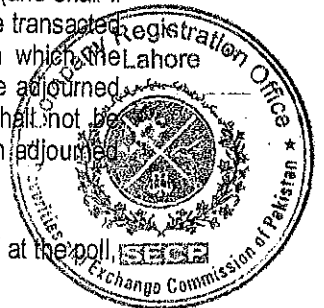
58. The chairman may, with the consent of any meeting at which a quorum is present (and shall if so directed by the meeting), adjourn the meeting from time to time but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment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

59. In the case of an equality of votes the Chairman shall, both on a show of hands and at the poll, have a casting vote in addition to the vote or votes to which he may be entitled as member.

60. (1) At any general meeting a resolution put to the vote of the meeting shall be decided on a show of hands, unless a poll is (before or on the declaration of the result of the show of hands) demanded in accordance with paragraph (2) of this article, and 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 or electronic record of the proceeding 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, the resolution.

(2) Any of the following persons may demand a poll:

- (a) The Chairman of the meeting, or
- (b) Five members having the right to vote on the resolution and present in person or by proxy; or
- (c) Any member or members present in person or by proxy having not less than one-tenth of the total voting power in respect of the resolution.



61. If a poll is demanded, as aforesaid, it shall be taken (subject to provisions of the ordinance) in such manner and at such time and place as the Chairman of the meeting directs, and either at once or after an interval or adjournment of not more than fourteen days from the day on which the poll is demanded, and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was held. The demand for a poll may be withdrawn at any time by the person or persons who made the demand. In case of any dispute as to the admission or rejection of a vote, the Chairman of the meeting shall determine the same, and such determination made in good faith shall be final and conclusive.

62. Any poll duly demanded on the election of a Chairman of a meeting or on any question of adjournment shall be taken at the meeting and without adjournment. A poll demanded on any other question shall be taken at such time, not being more than 14 days from the day on which the poll is demanded as the Chairman of the meeting directs.

63. The demand of a poll shall not prevent the continuance of a meeting for the transaction of any business other than the question on which a poll has been demanded.

VOTES OF MEMBERS

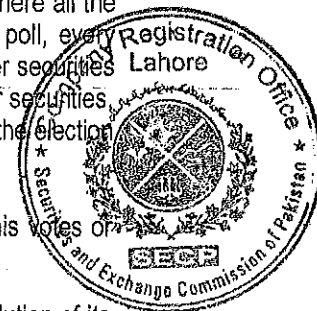
64. Subject to provisions of the ordinance and any rights or restrictions for the time being attached to any class or classes of shares on a show of hands, every member present in person (where all the participants of a general meeting can see each other) shall have one vote and upon a poll, every member present in person or by proxy shall have one vote in respect of every share or other securities carrying voting rights held by him according to the entitlement of the class of such shares or securities, as the case may be provided that, the provisions of the ordinance shall apply in the case of the election or removal of directors.

65. On a poll a member entitled to more than one vote need not, if he votes, use all his votes or cast all the votes he uses in the same way.

66. Any company or other corporation which is a member of the company may by resolution of its directors or other governing body authorise 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 so authorised shall be entitled to exercise the same powers on behalf of the company or corporation which he represents as that company or corporation could exercise if it were an individual member of the company, present in person. The production before or at the meeting of a copy of such resolution purporting to be signed by a director or the secretary of such company or corporation and certified by him as being a true copy of the resolution shall be accepted by the company as sufficient evidence of the validity of the appointment of such representative.

67. Any person entitled under the articles for transmission of shares may vote at any general meeting in respect thereof in the same manner as if he were the registered holder of such shares, provided that forty-eight hours at least before the time of holding the meeting or adjourned meeting, as the case may be, at which he proposes to vote he shall satisfy the directors of his right to such shares, or the directors shall have previously admitted his right to vote at such meeting in respect thereof. If any member be a lunatic, idiot or non compos mentis, he may vote, whether by a show of hands or at a poll, by his committee, curator bonis or other legal curator and such last mentioned persons may give their votes by proxy.

68. Where there are jointly registered holders of any share, any one of such persons may vote at any meeting either in person or by proxy in respect of such share as if he were solely entitled thereto;



and if more than one of such joint-holders be present at any meeting, either in person or by proxy, that one of the said persons so present whose name stands first in the register in respect of such share shall alone be entitled to vote in respect thereof. Several executors or administrators of a deceased member in whose name any share stands shall for the purposes of this article be deemed joint holders thereof.

69. On a poll votes may be given either in person or by proxy or in the case of a company by a representative of a company duly authorised as aforesaid.

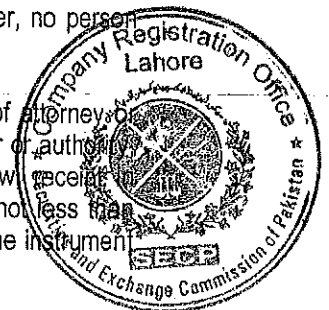
70. No objection shall be raised to the qualification of any voter except at the meeting or adjourned meeting at which the vote objected to is given or tendered, and every vote not disallowed at such meeting shall be valid for all purposes. Any such objection made in due time shall be referred to the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

71. The instrument appointing a proxy shall be in writing under the hand of the appointer (such expression shall exclude any reference to the Electronic Transactions Ordinance in accordance with the provisions of the Electronic Transactions Ordinance) or of his attorney duly authorised in writing (such expression shall exclude electronic transmission as prescribed by the provisions of the Electronic Transactions Ordinance) or if such appointer is a corporation under its common seal or signed by an officer or an attorney duly authorised by it (Such expression shall exclude any reference to the Electronic Transactions Ordinance in accordance with the provisions of the Electronic Transactions Ordinance). Save as an alternate director being representing a member as his appointer, no person shall be appointed a proxy who is not a member of the company and qualified to vote.

72. Subject to aforesaid article, the instrument appointing a proxy and the power of attorney or other authority (if any) under which it is signed, or a notarially certified copy of that power of authority shall be deposited (Such expression shall hereinafter include, where permitted by law, receipt in accordance with the provisions of the Electronic Transactions Ordinance) 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.

73. A vote given in accordance with the terms of an instrument appointing a proxy shall be valid notwithstanding the previous death or insanity of the principal or revocation of the instrument or transfer of the share in respect of which the vote is given, provided no intimation in writing of the death, insanity, revocation or transfer of the share shall have been received at the office before the meeting. Provided nevertheless that the Chairman of any meeting shall be entitled to require such evidence as he may in his discretion think fit of the due execution of an instrument of proxy and that the same has not been revoked.

74. Every instrument appointing a proxy shall, as nearly as circumstances will admit, be in the form or to the effect following and shall be retained by the company:



RYK ENERGY LIMITED
Proxy Form

I / We, _____ of _____
being the member of RYK Energy Limited
hereby appoint Mr./Mrs./Miss. _____
who is a member of the company vide Registered Folio No. _____
or failing whom Mr./Mrs./Miss. _____
Who is also a member of the company vide Registered Folio No. _____
as my proxy to attend and vote for me and own my behalf at the annual / extra ordinary general meeting of the company to
be held on (day) (date) (month) (year) at _____ A.M / P.M and / or at any adjournment thereof

(Signature on Rupees
Five Revenue Stamp)

(Signature should agree with the specimen signature registered with the company)

WITNESSES:

i. Signature _____
 Name _____
 Address _____

CNIC [] [] [] [] [] - [] [] [] [] [] [] - []
or passport No. _____

Date: _____

ii. Signature
Name
Address

CNIC _____
or passport No. _____

Date: _____



NOTES

- I. The proxy form must be signed across Rupees Five revenue stamp and it should be deposited in the company's registered office not less than 48 hours before the time of holding the meeting.
- II. If a member appoints more than one proxy and more than one instruments of proxy are deposited by a member with the company, all such instruments of proxy shall be rendered invalid.
- III. A member entitled to attend may appoint an other member as his / her proxy or may by power of attorney authorize any other person as his / her agent to attend, speak and vote at the meeting. A corporation or a company, as the case may be, being a member of the company, may appoint any of its officials or any other person to act as its representative and the person so authorized shall be entitled to the same powers as if he were and individual share holder.

Provided always that an instrument appointed a proxy may be in the form set out in regulation 39 of Table A of the first schedule to the ordinance.

IV. DIRECTORS

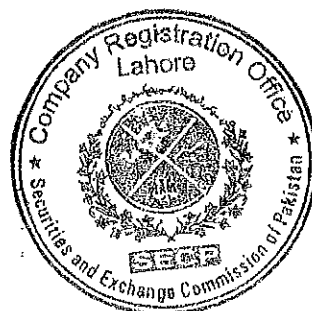
NUMBER OF DIRECTORS

75. Subject to the provisions of these articles and the ordinance, all directors shall be elected by the members in general meeting.

76. The company shall have at least three directors. Subject to the said minimum, the directors themselves shall determine from time to time in the manner provided in this article the number of directors that the company shall have. The directors shall fix the number of elected directors atleast 35 days before the convening of the general meeting at which the directors are to be elected that the company shall have from the effective date of the election. The number of elected directors so fixed by the directors shall not be changed except with the prior approval of the company in general meeting.

77. The following shall be the first directors of the company.

- (1) Mr. Naseem Javaid
- (2) Makhdum Omar Sheryar
- (3) Mrs. Tehmina Sadiq Javaid
- (4) Mrs. Bilqees Fatima
- (5) Mr. Munir Hussain
- (6) Mrs. Riffat Zamani



ALTERNATE DIRECTORS

78. A director who is about to leave or is absent for a period of three months or more from Pakistan may with the approval of the directors appoint any person as per provisions of section 192 of the Ordinance as a director to be an alternate director during his absence from Pakistan and such appointment shall have effect and such appointee, whilst he holds office as an alternate director, shall be entitled to notice of meetings of the directors and to attend and vote thereat and to exercise in place of his appointer all the functions of his appointer as a director of the company but he shall ipso facto vacate office as and when his appointer returns to Pakistan or vacates office as a director or removes the appointee from office. Any appointment or removal under this article shall be effected by notice in writing under the hand of the director making the same. An alternate director need not hold any share qualification.

79. An alternate director, even if not a member, shall, in the absence of a direction to the contrary in the instrument appointing him, be entitled to notice of general meetings of the company and (subject to the provisions of these articles) to vote at such meetings on behalf of his appointer, if his appointer is a member of the company, and generally to represent his appointer.

CHIEF EXECUTIVE

80. The company shall have an office of Chief Executive which shall be filled from time to time by the directors who may appoint a director or (subject to provisions of the ordinance) any other person to be the Chief Executive of the company for a period not exceeding three years and on such terms and conditions as the directors may think fit, and such appointment shall be made within fourteen days from the date on which the office of Chief Executive falls vacant. If the Chief Executive at any time is not already a director he shall be deemed to be a director of the company notwithstanding that the number of directors shall thereby be increased and he shall be entitled to all the rights and privileges and shall

be subject to all liabilities of the office of director. Upon the expiry of his period of office, a Chief Executive shall be eligible for re-appointment. The Chief Executive may be removed from office in accordance with the provisions of the ordinance notwithstanding anything contained in these articles or in any agreement between the company and the Chief Executive.

81. A Chief Executive of the company shall receive such remuneration as the directors may determine and it may be made a term of his appointment that he be paid a pension and/or gratuity and/or other benefits on retirement from his office.

82. The directors may from time to time entrust to and confer upon the Chief Executive for the time being such of the powers exercisable under these articles by the directors as they may think fit, and may confer such powers for such time, and to be exercised for such objects and purposes, and upon such terms and conditions, and with such restrictions as they think expedient; and they may confer such powers, either collaterally with, or to the exclusion of, and in substitution for all or any of the powers of the directors in that behalf; and may from time to time revoke, withdraw, alter or vary all or any of such powers.

QUALIFICATION AND REMUNERATION OF DIRECTORS

83. Any director who serves on any committee or who devotes special attention to the business of the company, or who otherwise performs services which in the opinion of the directors are outside the scope of the ordinary duties of a director, may be paid such extra remuneration as the directors may determine from time to time. The remuneration of a director for attending meetings of the board shall from time to time be determined by the directors.

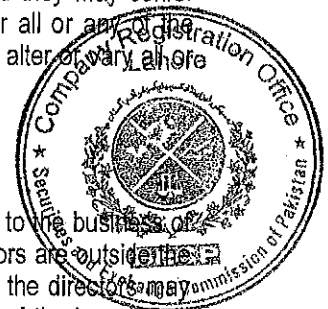
84. Each director of the company may, in addition to any remuneration receivable by him, be reimbursed his reasonable travelling and hotel expenses incurred in attending meetings of the directors or of the company or otherwise whilst employed on the business of the company.

85. The qualification of an elected director, in addition to his being a member, where required, shall be his holding shares of the nominal value of Rs. 100 at least in his own name, but a director representing the interests of a member or members holding shares of the nominal value of Rs. 100 at least shall require no such share qualification. A director shall not be qualified as representing the interests of a member or members holding shares of the requisite value unless he is appointed as such representative by the member or members concerned by notice in writing addressed to the company specifying the shares of the requisite value appropriated for qualifying such director. Shares thus appropriated for qualifying a director shall not, while he continues to be such representative, be appropriated for qualifying any other director. A director shall acquire his share qualification within two (2) months from the effective date of his appointment as director.

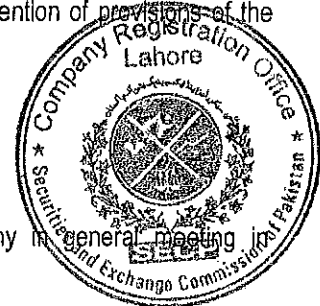
86. The continuing directors may act notwithstanding any vacancy in their body so long as their number is not reduced below the number fixed by or pursuant to these articles as the necessary quorum of directors.

87. The office of a director shall ipso facto be vacated if:

- (a) he ceased to hold the share qualification, if any, necessary for his appointment; or
- (b) he is found to be of unsound mind by a court of competent jurisdiction; or



- (c) he is adjudged an insolvent; or has applied to be adjudicated as an insolvent and his application is pending or is an undischarged insolvent; or
- (d) he has been convicted by a court of law for an offence involving moral turpitude;
- (e) he or any firm of which he is a partner or any private company of which he is a director without the sanction of the company in general meeting accepts or holds any office of profit under the company other than that of a chief executive or legal or technical adviser or a banker in contravention of the provisions of the ordinance;
- (f) 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; or
- (g) he or any firm of which he is a partner or any private company of which he is a director accepts a loan or guarantee from the company in contravention of provisions of the ordinance; or
- (h) he acts in contravention of provisions of the ordinance; or
- (i) by notice in writing to the company he resigns his office; or
- (j) he is removed from office by resolution of the company in general meeting in accordance with provisions of the ordinance;
- (k) his appointment is withdrawn by the Authority nominating him as director;
- (l) he has betrayed lack of fiduciary behaviour and a declaration to the effect has been made by the court under the provisions of the ordinance at any time during the preceding five years.



88. Subject to authorisation being given by the directors in accordance with the provisions of the ordinance, a director shall not be disqualified from contracting with the company either as vendor, purchaser or otherwise, nor shall any such contract or arrangement entered into by or on behalf of the company with any company or partnership of or in which any director of the company shall be a 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 realised by any such contract or arrangement by reason of such director holding that office or of the fiduciary relationship so established. A director who, or whose spouse or minor child, is in any way, whether directly or indirectly, concerned or interested in any contract or arrangement or proposed contract or arrangement with the company shall disclose the nature of such concern or interest in accordance with the provisions of the ordinance that is to say:

- (a) in the case of a contract or arrangement to be entered into, at the meeting of the directors at which the question of entering into the contract or arrangement is first taken into consideration or, if the director was not, on the date of that meeting, concerned or interested in the contract or arrangement, at the first meeting of the directors held after he becomes so concerned or interested; and
- (b) in the case of any other contract or arrangement, at the first meeting of the directors held after the director becomes concerned or interested in the contract or arrangement.

A general notice that any director of the company is a director or a member of any other named 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. Provided, however, that any such general notice shall expire at the end of the financial year in which it was given and may be renewed for a further period of one financial year at a time by giving fresh notice in the last month of the financial year in which it would otherwise expire.

89. Whereby any contract or resolution of the directors an appointment or a variation in the terms of an existing appointment is made (whether effective immediately or in the future) of a Chief Executive, whole time director or secretary of the company, in which appointment of any director of the company is, or after the contract or resolution becomes, in any way, whether directly or indirectly, concerned or interested, or whereby any contract or resolution of the directors, an appointment or a variation in the terms of appointment is made (whether effective immediately or in the future) of a Chief Executive, the company shall inform the members of such appointment or variation in the manner required by the provisions of the ordinance and shall comply with the requirements of that section in regard to the maintaining of such contracts and resolutions open for inspection by members at the office, the provision of certified copies thereof and extracts therefrom and otherwise.

90. In accordance with the provisions of the ordinance, the company shall maintain at its office a register or electronic record, in which shall be entered separately particulars of all contracts, arrangements or appointments in which the directors are interested. Such register or electronic record shall be open to inspection to the members during business hours, subject to any reasonable restriction that may be imposed by the company in general meeting.

91. A director of the company may be or become a director of any other company promoted by the company or in which the company may be interested as a vendor, shareholder or otherwise, and such director shall be accountable for any benefits received as a director or member of such other company.



ELECTION OF DIRECTORS

92. The number of directors determined by the directors under article 74 shall be elected to office by the members in general meeting in the following manner, namely:

- (a) a member present in person or by proxy shall have such number of votes as is equal to the product of voting shares held by him and the number of directors to be elected
- (b) a member may give all his votes to a single candidate or divide them between more than one of the candidates in such manner as he may choose, 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.

If the number of persons who offer themselves to be elected as directors is not more than the number of vacancies for which elections are being held, such persons being otherwise eligible shall be deemed to have been elected as directors from the date on which the election was proposed to be effective.

93. A director elected under these articles shall hold office for a period of three years unless he earlier resigns or becomes disqualified from being a director, or otherwise ceases to hold office.

94. A retiring director of the company shall be eligible for re-election.

95. The company in general meeting may remove a director from office by a resolution passed with the requisite number of votes determined in accordance with the provisions of the ordinance.

96. Any casual vacancy occurring among the directors may be filled up by the directors and the person so appointed shall hold office for the remaining period of the director in whose place he is appointed. Provided that the directors may not fill a casual vacancy by appointing any person who has been removed from the office of a director of the company under these articles.

97. No person including a retiring director of the company shall be eligible for election to the office of director of the company at any general meeting unless he has, not less than fourteen days before the date of the meeting, left at the office, a notice in writing, duly signed, signifying his candidature for the office.

98. The company shall keep at the office a register of the directors and officers, containing the particulars required by the provisions of the ordinance and the company shall otherwise comply with the provisions of that section as regards furnishing returns to the Registrar and giving inspection of the register.

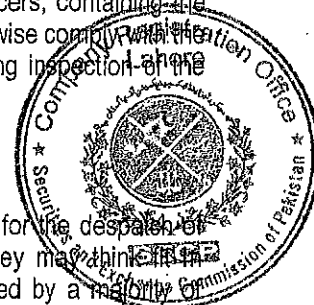
PROCEEDINGS OF DIRECTORS

99. The directors shall meet together at least once in each quarter of a year for the despatch of business, adjourn and otherwise regulate their meetings and proceedings as they may think fit in accordance with the ordinance. Questions arising at any meeting shall be decided by a majority of votes and in case of an equality of votes the Chairman shall have a second or casting vote.

100. The quorum necessary for the transaction of the business of the directors shall be two directors, present in person. An alternate director whose appointment is effective shall be counted in a quorum. If all the directors except one are disqualified from voting, the matter should be decided in general meeting.

101. A director may, and the secretary on the requisition of a director shall, at any time summon a meeting of the directors. Such meetings may be held using any technology consented to by all the directors, including but not limited to telephone and video conferencing. The consent may be a standing one, withdrawable by a director only within a reasonable period of time before the meeting. It shall not be necessary to give notice of a meeting of directors to any director for the time being absent from Pakistan.

102. The board of directors of the company shall from time to time elect one of the directors as Chairman of the board of directors of the company and determine the period for which he is to hold office and his remuneration. The Chairman or in his absence the Chief Executive shall preside over all meetings of the board of directors, but if at any meeting neither the Chairman nor the Chief Executive is present in person within half an hour of the time appointed for holding the same, the directors present in person may choose one of their number to be Chairman of the meeting.



103. A meeting of the directors at which a quorum is present shall be competent to exercise all or any of the authorities, powers and discretion by or under these articles for the time being vested in or exercisable by the directors generally.

104. The directors may from time to time delegate of their powers to committees consisting of such two members or more members of their body as they think fit, and may from time to time revoke such delegation. Any committee so formed shall, in the exercise of the powers so delegated, conform to any regulations that may from time to time be imposed upon it by the directors.

105. The meeting and proceedings of any such committee consisting of two or more members shall be governed by the provisions herein contained for regulating the meetings and proceedings of the directors, so far as the same are applicable thereto and are not superseded by any regulations made by the directors under these articles.

106. All acts done by any meeting of the directors or by a committee of the directors or by any person acting as a director of the company shall, notwithstanding that it shall afterwards be discovered that there was some defect in the appointment or continuance in office of any such directors or person acting as aforesaid, or that they or any of them were disqualified or had vacated office, or were not entitled to vote, be as valid as if every such person had been duly appointed or had duly continued in office and was qualified and had continued to be a director and had been entitled to be a director. Provided that nothing in this article shall be deemed to give validity to acts done by any such director after the appointment of such director has been shown to be invalid.

107. A resolution, other than resolution in respect of any matter specified in the provisions of the ordinance circulated through fax or email or any form of electronic transmission to all the directors at the time being entitled to receive notice of a meeting of the directors, passed without any meeting of the directors or of a committee of directors and signed or affirmed through fax or email or any form of electronic transmission, by a majority of all directors in writing under the hands of all directors (or in their absence their alternate directors) for the time being in Pakistan, being not less than the quorum required for meetings of the directors, or as the case may be, of the members of the committee, shall be valid and effectual as if it had been passed at the meeting of the directors, or as the case may be of such committee, duly called or constituted. The resolution in writing of the company may consist of several copies of a document signed by one or more director(s) and takes effect at the date and time on which the last director, necessary for the resolution to be passed, signs a copy of the resolution; or a record of several signed electronic messages each indicating the identity of the sender, the text of the resolution and the sender's agreement or disagreement to the resolution, as the case may be and such a resolution takes effect on the date on which the last director's message, necessary for the resolution to be passed, is received.

108. If any director of the company, being willing, shall be called upon to perform extra services or to make any special exertions in going or residing away from his place of business for the time being for any of the purposes of the company or in giving special attention to the business of the company as a member of a committee of the directors, the company may remunerate such director so doing either by a fixed sum or by a percentage of profits or otherwise as may be determined by the directors, and such remuneration may be either in addition to or in substitution for his or their share in the remuneration above provided for the directors.

MINUTES

109. The directors shall cause minutes to be duly entered in books provided for the purpose of or as an electronic record, of,

- (a) all appointments of officers;
- (b) the names of the directors present in person at each meeting of the directors and of any committee of the directors;
- (c) all orders made by the directors and committees of the directors;
- (d) all resolutions and proceedings of general meeting and of meetings of the directors and of the committees of the directors;

and any such minutes of any meeting of the directors or of any such committee or of the company, if purporting to be signed by the Chairman of such meeting or by the Chairman of the next succeeding meeting, shall be prima facie evidence of the matter stated in such minutes.

POWERS AND DUTIES OF DIRECTORS

110. The directors shall duly comply with the provisions of the ordinance. In particular and without prejudice to the generality of the foregoing, the company shall comply with the provisions of the ordinance in regard to the registration of the particulars of mortgages and charges affecting the property of the company or created by it, to the keeping of a register of the directors, and to the sending to the Registrar of an annual list of members and a summary of particulars relating thereto, and notice of any consolidation or increase of share capital, sub-division of shares, and copies of special resolutions and a copy of the register of directors and notifications of any changes therein. All such information may be stored as an electronic record and transmitted accordingly, where possible.

111. The control of the company shall be vested in the directors, and the business of the company shall be managed by the directors who may exercise all such powers of the company and do all such acts and things as may be exercised or done by the company as by the ordinance or by these articles or by a special resolution expressly directed or required to be exercised or done by the company in general meeting, subject nevertheless to any regulations of these articles, to the provisions of the ordinance, and to such regulations being not inconsistent with the aforesaid regulations or provisions, as may be prescribed by the company in general meeting; but no regulation made by the company in general meeting shall invalidate any prior act of the directors which would have been valid if that regulation had not been made.

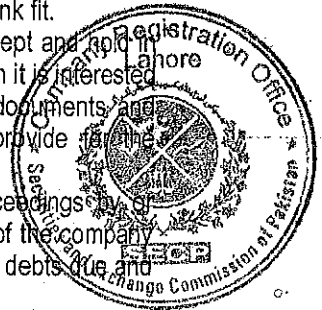
112. Without prejudice to the general powers conferred by these articles and to any other powers or authorities conferred by these articles on the directors, it is hereby expressly declared that the directors shall have the following powers, that is to say, power:

- (1) To purchase or otherwise acquire for the company any property, rights or privileges which the company is authorised to acquire at such price and generally on such terms and conditions as they think fit, and to sell, let, exchange or otherwise dispose of absolutely or conditionally any part of the property, privileges and undertaking of the



company upon such terms and conditions, and for such consideration, as they may think fit.

- (2) At their discretion to pay for any property, rights, privileges acquired by or services rendered to the company either wholly or partially in cash or in shares (subject to the provisions of the ordinance) bonds, debentures or other securities of the company. Any such bonds, debentures or other securities may be either specifically charged upon all or any part of the property of the company or not so charged.
- (3) To open account with any bank or financial institution and deposit into and withdraw money from such accounts from time to time.
- (4) To make, draw, endorse, sign, accept, negotiate and give all cheques, bills of lading, drafts, orders, bills of exchange, and other promissory notes and negotiable instruments required in the business of the company.
- (5) To secure the fulfilment of any contracts, agreements or engagements entered into by the company by mortgage or charge of all or any of the property of the company for the time being or in such other manner as they may think fit.
- (6) Subject to the provisions of the ordinance, to appoint and at their discretion remove or suspend such agents (other than managing agents), managers, secretaries, officers, employees for permanent, temporary or special services as they may from time to time think fit, and to determine their powers and duties and fix their salaries or emoluments and to require security in such instances and to such amount as they think fit.
- (7) To appoint any person or persons (whether incorporated or not) to accept and hold in trust for the company any property belonging to the company or in which it is interested or for any other purposes, and to execute and do all such deeds, documents, and things as may be requisite in relation to any such trust and to provide for the remuneration of such trustee or trustees.
- (8) To institute, conduct, defend, compound or abandon any legal proceedings by or against the company or its officers or otherwise concerning the affairs of the company, and also to compound and allow time for payment or satisfaction of any debts due and of any claims or demands by or against the company.
- (9) To refer claims or demands by or against the company to arbitration and observe and perform the awards.
- (10) To make and give receipts, releases and other discharges for money payable to the company and for the claims and demands of the company.
- (11) To act on behalf of the company in all matters relating to bankrupts and insolvents.
- (12) To determine who shall be entitled to sign on the company's behalf bills, notes, receipts, acceptances, endorsements, cheques, releases, contracts and documents.
- (13) From time to time to provide for the management of the affairs of the company either in different parts of Pakistan or elsewhere in such manner as they think fit, and in particular to establish branch offices and to appoint any persons to be the attorneys or agents of the company with such powers (including power to sub-delegate) and upon such terms as may be thought fit.
- (14) To invest and deal with any of the moneys of the company not immediately required for the purposes thereof upon such securities and in such manner as they may think fit, and from time to time to vary or realise such investments.
- (15) To execute in the name and on behalf of the company in favour of any director of the company or other person who may incur or be about to incur any personal liability for the benefit of the company, such mortgages of the company's property (present and future) as they think fit, and any such mortgage may contain a power of sale and such other powers, covenants and provisions as shall be agreed on.
- (16) To give to any person employed by the company, a commission on the profits of any particular business or transaction or a share in the general profits of the company, and



such commission or share of profits shall be treated as part of the working expenses of the company.

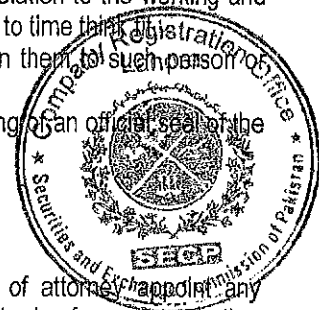
- (17) From time to time to make, vary and repeal bye-laws for the regulation of the business of the company, its employees.
- (18) To enter into all such negotiations and contracts and rescind and vary all such contracts and execute and do all such acts, deeds and things in the name and on behalf of the company as they may consider expedient for or in relation to any of the matters aforesaid or otherwise for the purposes of the company.
- (19) To establish, maintain, support and subscribe to any charitable or public object, and any institution, society, or club which may be for the benefit of the company or its employees, or may be connected with any town or place where the company carries on business; to give pensions, gratuities, or charitable aid to any person or persons who have served the company or to the wives, children, or dependants of such person or persons, that may appear to the directors just or proper, whether any such person, his widow, children or dependants, have or have not a legal claim upon the company.
- (20) Subject to the provisions of the ordinance, before recommending any dividends, to set aside portions of the profits of the company to form a fund to provide for such pensions, gratuities, or compensation; or to create any provident or benefit fund in such or any other manner as to the directors may seem fit.
- (21) Subject to the provisions of the ordinance to accept from any member on such terms and conditions as shall be agreed a surrender of his shares or any part thereof.
- (22) To make advances and loans without security or on such security as they may deem proper and as permissible under the law.
- (23) To make and alter rules and regulations concerning the time and manner of payment of the contributions of the employees and the company respectively to any such funds and the accrual, employment, suspension and forfeiture of the benefits of the said fund and the application and disposal thereof, and otherwise in relation to the working and management of the said fund as the directors shall from time to time think fit.
- (24) To delegate all or any of the powers hereby conferred upon them to such person or persons as they may from time to time think fit.
- (25) Subject to the provisions the ordinance to authorise the having of an official seal of the company for use abroad.

POWER OF ATTORNEY

113. The directors may from time to time and at any time by power of attorney appoint any company, firm or person (including any director or officer of the company) or body of persons, whether nominated directly or indirectly by the directors, to be the attorney or attorneys of the company for such purposes and with such powers, authorities and discretions and for such period and subject to such conditions as they may think fit, and any such powers of attorney may contain such provisions for the protection and convenience of persons dealing with any such attorney to delegate all or any of the powers, authorities and discretions vested in him; and without prejudice to the generality of the foregoing any such power of attorney may authorise the attorney to institute, conduct, defend, compound or abandon any legal proceedings by or against the company, whether generally or in any particular case.

BORROWING POWERS

114. (1) The directors may exercise all the powers of the company to borrow money and to mortgage or charge its undertaking, property and assets (both present and future), and



to issue debentures, debenture stocks, and other securities, whether outright or as collateral security for any debt, liability or obligation of the company or of any third party

- (2) In exercising the powers of the company aforesaid the directors may, from time to time and on such terms and conditions as they think fit, raise money from banks and financial institutions and from other persons under any permitted system of financing, whether providing for payment of interest or some other form of return, and in particular the directors may raise money on the basis of the mark up on price, musharika, modaraba or any other permitted mode of financing, and without prejudice to the generality of the foregoing the directors may exercise all or any of the powers of the company arising under the provisions of the ordinance.
- (3) In regard to the issue of securities the directors may exercise all or any of the powers of the company arising under provisions of the ordinance and in particular the directors may issue any security as defined in the ordinance or may issue any instrument or certificate representing redeemable capital as defined in the ordinance or participatory redeemable capital as defined in the ordinance.

115. Debentures, debenture-stock, bonds and other securities may be made assignable free from any equities between the company and the person to whom the same may be issued.

116. Any debentures, debenture-stock, bonds or other securities may be issued at a discount, premium or otherwise and with any special privileges as to redemption, surrender, drawing, allotment, registration, shares, attending and voting at general meetings of the company, appointment of directors or otherwise.

117. The directors shall cause a proper register to be kept in accordance with the provisions of the ordinance, of all mortgages and charges specifically affecting the property of the company, and shall duly comply with the provisions of the ordinance, regarding registration of mortgages and charges, endorsement of certificates, filing of prescribed particulars, keeping of a copy of every instrument creating any mortgage or charge by the company at the office and giving of intimation of the payment or satisfaction of any charge or mortgage created by the company.

118. Every register of holders of debentures of the company may be closed for any periods not exceeding in the whole forty five days in any year and not exceeding thirty days at a time. Subject as aforesaid, every such register shall be open to the inspection of members or debenture holders. But the company may in general meeting impose any reasonable restrictions, so that at least two hours, in each day when such register is open, for inspection.

119. Subject to the provisions of the ordinance, no transfer of registered debentures shall be registered unless a proper instrument of transfer duly stamped and executed by the transferor and transferee has been delivered to the company together with the certificate or certificates of the debentures.

120. If the directors refuse to register the transfer of any debentures, they shall, within thirty days from the date on which the instrument of transfer was lodged with the company, send or cause to be sent to the transferee and transferor notice of the refusal.

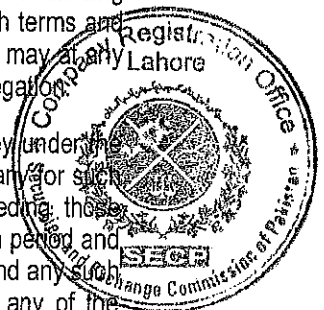
121. The company shall comply with the provisions of the ordinance as to allowing inspection of copies kept at the office in pursuance of the provisions of the ordinance, and as to allowing inspection of the register of mortgages to be kept at the office in pursuance to provisions of the ordinance.

122. The company shall comply with the provisions of the ordinance as to supplying copies of any register of holders of debentures or of any trust deed for securing any issue of debentures.

LOCAL MANAGEMENT

123. Subject to the provisions of the ordinance, directors may from time to time provide for the management of the affairs of the company outside Pakistan or in any special locality in Pakistan in such manner as they shall think fit and the following provisions shall operate without prejudice to the general powers hereby conferred.

- (1) The directors may from time to time and at any time establish any local boards or agencies for managing any of the affairs of the company outside Pakistan or in any specified locality in Pakistan and may appoint any persons to be members of such local board or any managers or agents and may fix their remuneration.
- (2) The directors may from time to time and at any time delegate to any persons so appointed any of the powers, authorities and discretions for the time being vested in the directors and may authorise the members for the time being of any such local board or any of them to fill up any vacancies therein and to act notwithstanding vacancies and any such appointment or delegation may be made on such terms and subject to such conditions as the directors may think fit; and the directors may at any time remove any person so appointed and may annul or vary any such delegation.
- (3) The directors may at any time and from time to time, by power of attorney under the seal of the company, appoint any person to be the attorneys of the company for such purposes and with such powers, authorities and discretions (not exceeding those vested in or exercisable by the directors under these articles) and for such period and subject to such conditions as the directors may from time to time think fit; and any such appointment may, if the directors think fit, be made in favour of all or any of the members of any local board established as aforesaid, or in favour of any company or of the members, directors, nominees or managers of any company or firm, and any such power of attorney may contain such provisions for the protection or convenience of persons dealing with such attorneys as the directors think fit.
- (4) Any such delegates or attorneys as aforesaid may be authorised by the directors to sub-delegate all or any of the powers, authorities and discretions for the time being vested in them.



V. ACCOUNTS AND DIVIDENDS

BOOKS OF ACCOUNT

(References to books of account, balance sheet, profit and loss accounts and auditors' report shall hereinafter mutatis mutandis include all electronic forms of record or storage of the company.)

124. The directors shall cause to be kept proper books of account with respect to the matters set out under the provisions of the ordinance.

125. The books of account shall be kept at the office or at such other place as the directors think fit, and shall be open to inspection by the directors during business hours. If the directors decide to keep the books of account at a place other than the office they shall comply with the directions contained in the provisions of the ordinance.

126. The company shall preserve in good order the books of account of the company in respect of any financial year for a period of ten years following the close of that year.

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

128. (1) The directors shall arrange to place before the annual general meeting of the company in every year a duly audited balance sheet and profit and loss account, conforming to the requirements of provisions of the ordinance and made up to a date not more than four months before the date of such meeting and having the auditor's report attached thereto, and a report of the directors conforming to the requirements of provisions of the ordinance.

(2) As required by the provisions of the ordinance the balance sheet and profit and loss account shall first be approved by the directors and when so approved shall be signed by the Chief Executive and at least one director but if on account of his absence from Pakistan or other reason the signature of the Chief Executive cannot be obtained the balance sheet and profit and loss account shall be signed by at least two directors from the time being in Pakistan, and in every such case a statement signed by those two directors shall be subjoined to the balance sheet and profit and loss account stating the reason why the signature of the Chief Executive was not obtained.

(3) The directors may authorize the Chairman or the Chief Executive to sign the report of the directors which may then be signed accordingly, but in the absence of any such authority the report of the directors shall be signed as required by the provisions of the ordinance in the same manner as the balance sheet and profit and loss account.

129. (1) A copy of the balance sheet, profit and loss account and the reports of the directors and auditors shall be sent not less than twenty one (21) days before the date of the annual general meeting to the members and other 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 kept for a period of at least twenty one (21) days before the meeting at the office for inspection by members.

(2) After the balance sheet, profit and loss account and the reports of the directors and auditors have been laid before the annual general meeting of the company, two copies thereof (or, such larger number as may be prescribed under the provisions of the ordinance) signed by the signatories thereto shall be filed with the registrar within thirty



days from the date of the meeting and the company shall also comply with the provisions of the ordinance where applicable.

130. The directors shall in all respects comply with the provisions of the ordinance, or any statutory modification thereof for the time being in force.

ANNUAL RETURNS

131. The company shall make the requisite annual returns in accordance with the provisions of the ordinance.

DIVIDENDS

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

133. No dividend shall be paid otherwise than out of the profits of the year or any other undistributed profits, and in the determination of the profits available for dividends the directors shall have regard to the provisions of the ordinance.

134. The declaration of the directors as to the amount of the net profits of the company shall be conclusive.

135. The directors may from time to time pay to the members such interim dividends as in their judgement the position of the company justifies.

136. All dividends shall be declared and paid according to the amounts paid on the shares. All dividends shall be apportioned and paid proportionally to the amounts paid or credited as paid on the shares during any portion or portions of the period in respect of which the dividend is paid; but if any share is issued on terms providing that it shall rank for dividend as from a particular date, such share shall rank for dividend accordingly.

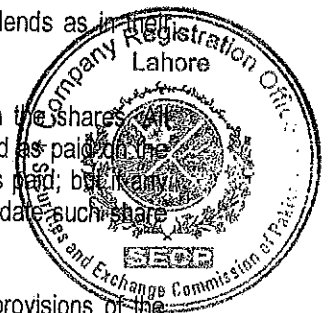
137. All dividends declared shall be paid within the periods specified under the provisions of the ordinance.

138. No dividend payable in respect of a share shall bear interest against the company.

139. The directors may retain any dividends on which the company has a lien and may apply the same in or towards satisfaction of the debts, liabilities or engagements in respect of which the lien exists.

140. Any general meeting declaring a dividend may resolve that such dividend be paid and satisfied wholly or in part in cash or by the distribution of specific assets, and in particular by the distribution of paid-up shares, debentures, debenture-stock or other security of the company, or paid-up shares, debentures, debenture-stock or other security of any other company, or in any one or more of such ways.

141. Any general meeting may resolve that any moneys, investments, or other assets forming part of the undivided profits of the company standing to the credit of the reserve fund referred to in these articles or in the hands of the company and available for dividend (or representing premiums received on the issue of shares and standing to the credit of the share premium account) be capitalised and



distributed amongst such of the members as would be entitled to receive the same if distributed by way of dividend and in the same proportion on the footing that they become entitled thereto as capital and that all or any part of such fund be applied on behalf of such members in paying up in full any un-issued shares, debentures, debenture-stock or other security of the company, which shall be distributed accordingly, and that such distribution or payment shall be accepted by such members in full satisfaction of their interest in the said capitalised sum.

142. For the purpose of giving effect to any resolution under these articles, the directors may settle any difficulty which may arise in regard to the distribution as they think expedient and may fix the value for distribution of any specific assets and may determine that cash payments shall be made to any members upon the footing of the value so fixed in order to adjust the rights of all parties and may vest any such cash or specific assets in trustees upon such trusts for the persons entitled to the dividend or capitalised fund as may seem expedient to the directors. Where requisite a proper contract shall be filed in accordance with the provisions of the ordinance, and the directors may appoint any person to sign such contract on behalf of the persons entitled to the dividend or capitalised fund, and such appointment shall be effective.

143. A transfer of shares shall not pass the rights to any dividend declared thereon before the registration of the transfer.

144. The directors may retain the dividends payable upon shares in respect of which any person is under these articles entitled to become a member or which any person under that article is entitled to transfer until such person shall become a member in respect thereof or shall duly transfer the same.

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

146. The dividend in respect of any share shall be paid to the registered holder of such share or to his banker or to a financial institution (as defined in the ordinance) nominated by him for the purpose. Unless otherwise directed, any dividend may be paid by cheque or warrant sent through post to the registered address of the member or person entitled thereto, or, in the case of joint-holders, to the registered address of that one whose name stands first on the register in respect of the joint-holding, or to such financial institution or bank as the member or person entitled thereto or such joint-holders, as the case may be, direct, and every cheque or warrant so sent shall be made payable to the order of the person to whom it is sent, or to the order of the institution or bank, directed as aforesaid.

147. All dividends unclaimed for one year after having been declared may be invested or otherwise made use of by the directors for the benefit of the company until claimed and all dividends unclaimed for three years after having been declared may be forfeited by the directors for the benefit of the company, but the directors may annul the forfeiture wherever they may think proper.

RESERVES

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

VI. AUDIT

149. Auditors shall be appointed and their duties regulated in accordance with provisions of the ordinance or any statutory modification thereof for the time being in force.

VII. SEAL

150. The directors shall provide a common seal of the company which shall not be affixed to any instrument except by the authority of a resolution of the board or by a committee of directors authorised in that behalf by the directors, and two (2) directors, or one (1) director and the secretary of the company, shall sign every instrument to which the common seal is affixed.

151. The directors may provide for the use in any territory, district or place not situated in Pakistan, of an official seal which shall be a facsimile of the common seal of the company, with the addition on its face of the name of every territory, district or place where it is to be used. The official seal shall not be affixed to any instrument except by the authority of a resolution of the board or by a committee of directors authorised in that behalf by the directors, and two (2) directors, or one (1) director and the secretary of the company, or such other person as the directors may appoint for the purpose, shall sign every instrument to which the official seal is affixed. The provisions of the ordinance shall apply to the use of the official seal.

VIII. NOTICES

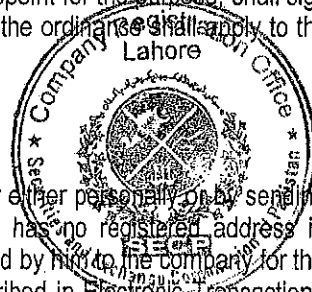
152. (1) A notice may be given by the company to any member either personally or by sending it by post to him at his registered address or (if he has no registered address in Pakistan) to the address, if any, within Pakistan supplied by him to the company for the giving of notices to him or in electronic form as prescribed in Electronic Transactions Ordinance.

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

153. In accordance with the provisions of the Electronic Transactions Ordinance, a notice dispatched by electronic transmission shall be deemed to be received by the addressee at his place of business or where he ordinarily resides when it reaches the designated information system of the addressee. If no information system has been so designated, receipt will occur when the electronic notice reaches an information system of the addressee.

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

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



156. Notice of every general meeting shall be given in same manner hereinbefore authorised to (a) every member of the company except those members who (having no registered address within Pakistan) have not supplied to the company either a postal address within Pakistan or electronic address for the giving of notices to them, and also to (b) every person entitled to a share in consequence of the death or insolvency of a member, who but for his death or insolvency would be entitled to receive notice of the meeting. Subject to the provisions of these articles and provisions of the ordinance, no other persons shall be entitled to receive notices of general meetings.

157. Any notice required to be given by the company to the members or any of them and not expressly provided for by these articles shall be sufficiently given, if given by advertisement.

158. Any notice required to be or which may be given by advertisement shall be advertised once in a newspaper circulating in the Province in which the registered office is situate.

159. Any notice given by advertisement shall be deemed to have been given on the day on which the advertisement shall first appear.

160. Every person who by operation of law, transfer or other means whatsoever shall become entitled to any share shall be bound by every notice in respect of such share which is given to his name and address being entered on the register shall be duly given to the person from whom he derives his title to such shares.

161. Any notice or document delivered or sent by post to or left at the registered address of any member in pursuance of these articles shall, notwithstanding that such member may be then deceased and whether or not the company shall have received notice of his decease, be deemed to have been duly served in respect of any registered shares whether held solely or jointly with other persons by such member, until some other person be registered in his stead as the holder or joint holder thereof, and such service shall for all purposes of these articles be deemed a sufficient service of such notice or document on his heirs, executors, or administrators, and all persons, if any, jointly interested with them in any such share.

162. The signature to any notice to be given by the company may be written or printed.

163. In the event of a winding up of the company, every member of the company who is not for the time being normally resident in the town in which the office is situate shall be bound, within eight weeks after the passing of an effective resolution to wind up the company voluntarily or the making of an order for the winding up of the company, to serve notice in writing on the company appointing some householder residing in that town upon whom all summonses, notices, process, orders and judgements in relation to or under the winding up of the company may served, and in default of such nomination the liquidator of the company shall be at liberty on behalf of such member to appoint some such person, and service upon any such appointee, whether appointed by the member or the liquidator, shall be deemed to be good personal service on such member for all purposes, and where the liquidator makes any such appointment he shall with all convenient speed give notice thereof to such member by advertisement in some newspaper circulating in the Province in which the office is situate or by a registered letter sent through the post and addressed to such member at his address as mentioned in the register, and such notice shall be deemed to be served on the day on which the advertisement shall first appear or on the day following that on which the letter is posted, as the case may be. The provisions of this article shall not prejudice the right of the liquidator to serve any notice or other document in any other manner prescribed by the regulations of the company.

IX. AMALGAMATION, DIVISION AND RECONSTRUCTION

164. Subject to and in accordance with the provisions of the ordinance, the company may reconstruct, amalgamate into an other company or divide into two (2) or more companies in the process of which the whole or any part of the undertaking, property or liabilities of the company or any other company, may be transferred to any other company or the company, respectively, as the case may be. Provided that any sale of the undertaking of the company, the directors, or the liquidator on a winding up, may, if authorised by a special resolution, accept fully paid shares, debentures or securities of any other company, whether incorporated in Pakistan or not, either then existing or to be formed, for the purchase in whole or in part of the property of the company, and the directors (if the profits of the company permit) or the liquidator (in a winding up) may distribute such shares, or securities, or any other property of the company amongst the members without realisation, or vest the same in trustees for them, and any special resolution may provide for the distribution or appropriation of the cash, shares or other securities, benefits or property, otherwise than in accordance with the strict legal rights of the members or contributories of the company, and for valuation of any such securities or property at such price in such manner as the meeting may approve, and all holders of shares shall be bound to accept and shall be bound by any valuation or distribution so authorised, and waive all rights in relation thereto, save only in case the company is proposed to be or is in the course of being wound-up, such statutory rights (if any) under provisions of the ordinance as are incapable of being varied or excluded by these articles.

X. SECRECY

165. Every director, manager, adviser, auditor, trustee, member of a committee, officer, servant, agent, accountant or other person employed in the business of the company shall, if so required by the directors before entering upon his duties, sign a declaration pledging himself to observe a strict secrecy respecting all transactions of the company with its customers and the state of accounts with individuals and in matters relating thereto and shall by such declaration pledge himself not to reveal any of the matters which may come to his knowledge in the discharge of his duties except when required to do so by the directors or by any meeting or by any Court of law and except so far as may be necessary in order to comply with any of the provisions in these articles contained.

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

XI. ARBITRATION

167. Whenever a difference arises between the company on the one hand and any of the members, their executors, administrators, or assignees on the other hand touching the true intent or construction or the incident or consequences of these presents, or of the status of enactment's of the legislature, or touching anything then or thereafter done, executed, omitted or suffered in pursuance of these presents or of the status of enactment's touching any breach or alleged breach or otherwise relating to the premises or to these presents, or to the status or to any of the affairs or officers of the company, the

company by written agreement refer to arbitration in accordance with the Arbitration Act 1940 (X of 1940) and every such difference shall be referred to the decision of an arbitrator to be appointed by the parties in difference or if they cannot agree upon a single arbitrator, to the decision of two arbitrators, one appointed by such party, or in the event of disagreement of the arbitrators, to that of an umpire appointed by arbitrators themselves. The provisions of Arbitration Act 1940 (X of 1940) shall apply to all arbitrations between the company and persons having such difference.

168. If either party to the difference makes default in appointing the arbitrator for fifteen days after the other party has given to him notice to appoint the same, such other party may appoint an arbitrator to act in the place of the arbitrators of the defaulting party.

169. The costs of, or incidental to any such reference and award shall be in the discretion of the arbitrator/arbitrators or umpire as the case may be who may determine the amount thereof and may award by whom, and to whom, and in what manner the same shall be borne and paid.

XII. WINDING UP

170. If the company shall be wound up and the assets available for distribution among the members, subject to the rights attached to any preference share capital, as such shall be insufficient to repay the whole of the paid-up capital, such assets shall be distributed so that as nearly as may be the losses shall be borne by the members in proportion to the capital paid up on the shares held by them respectively. And if in a winding up the assets available for distribution among the members shall be more than sufficient to repay the whole of the capital paid up at the commencement of the winding up, the excess shall be distributed amongst the members in proportion to the capital at the commencement of the winding up, paid up on the shares held by them respectively. But this article is to be without prejudice to the rights of the holders of shares issued upon special terms and conditions.

171. If the company shall be wound, whether voluntarily or otherwise, the liquidator may with the sanction of a special resolution divide among the members in specie or kind any part of the assets of the company, and may with the like sanction vest any part of the assets of the company in trustees upon such trusts for the benefit of the members or any of them as the liquidator with the like sanction shall think fit.

XIII. INDEMNITY

172. Every director or officer of the company and every person employed by the company as auditor shall be indemnified out of the funds of the company against all liability incurred by him as such director, officer or Auditor in defending any proceedings, whether civil or criminal, in which judgement is given in his favour, or in which he is acquitted, or in connection with any application under provisions of the ordinance in which relief is granted to him by the Court.

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

Sr. No.	Name & Surname (Present and former in full)	Father's/Husband's Name in full	Nationality	Residential Address	No. of ordinary shares taken by each Subscriber	Signature
1	Mrs. Naseem Javaid CNIC # 35202-5643424-0	W/o Mr. M. Sadiq Javed	Pakistani	H. No. 5-Q/A, Gulberg II, Lahore	500	
2	Makhdom Omar Sheryar CNIC # 42301-9725732-7	Makhdom Rukan- ud-Din	Pakistani	117/21, Khayabane-e-Bukhari DHA-VI, Karachi	500	
3	Mrs. Tehmina Sadiq Javaid CNIC # 42301-3018474-8	W/o Makhdom Omar Sheryar	Pakistani	117/21, Khayabane-e-Bukhari DHA-VI, Karachi	500	
4	Mrs. Bilquees Fatima CNIC # 35202-2265560-8	W/o Mr. Munir Hussain	Pakistani	178-Nishtar Block, Allama Iqbal Town, Lahore	500	
5	Mr. Munir Hussain CNIC # 35202-2570641-7	Mr. Nazir Hussain	Pakistani	178-Nishtar Block, Allama Iqbal Town, Lahore	500	
6	Mrs. Riffat Zamani CNIC # 31303-7349097-2	W/o Makhdom Rukan-ud-Din	Pakistani	Mianwali Qureshian, P.O. Khas, Distt. And Tehsil Rahim Yar Khan	500	
Total Shares Taken					3000	

Dated this 14 day of October, 2014

Witness to the above Signatures:

Full Name: NIFT (PRIVATE) LIMITED

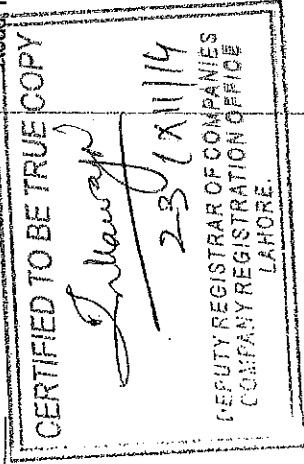
Father's/Husband's Full Name:

Signature:

Nationality: Pakistani

Occupation

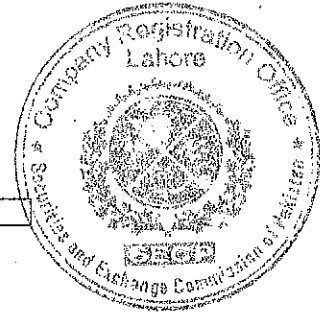
Full Address: 5th floor, AWT Plaza, I.I. Chundrigar
Road, Karachi 74200



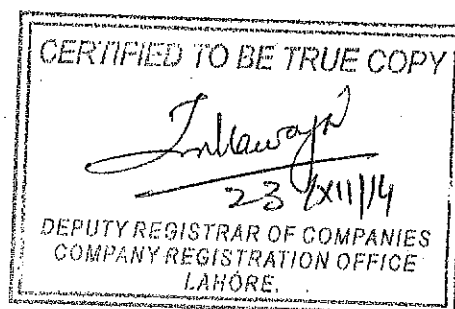
FORM 21

THE COMPANIES ORDINANCE, 1984
[SECTION 142]

NOTICE OF SITUATION OF REGISTERED OFFICE OR ANY CHANGE THEREIN



1. Incorporation Number		
2. Name of the Company	RYK ENERGY LIMITED	
3. Fee Paid (Rs.)	600.00	Name & Branch of the Bank LAHORE, MCB - Cavalry Ground [1508]
4. Receipt No.	E-2014-262722	15/10/2014
5. The situation of registered office of the company was changed from (previous address)		
6. The Registered Office of the company is now situated at	8-Shami Raod, Lahore Cantt Punjab 54810	
<small>(State the address and telephone number, name of the premises or building and street, lane and locality, and the name of the firm or individual owner, where applicable.)</small>		
6.1. Telephone Nos	042-36601381-4	
6.2. Fax No, if any	042-36601385	
6.3. Email Address	lm@racopk.com	
7. With Effect from (date)	Since Incorporation	
8. Signature of Chief Executive/Secretary		
9. Name of Signatory	Makhdom Omar Sheryar	
10. Designation	Director	
11. NIC Number of Signatory	42301-9725732-7	
12. Date (DD/MM/YYYY)	15/10/2014	



PARTICULARS OF DIRECTORS AND OFFICERS, INCLUDING THE CHIEF EXECUTIVE, MANAGING AGENT, SECRETARY, CHIEF ACCOUNTANT, AUDITORS AND LEGAL ADVISERS, OR OF ANY CHANGE THEREIN

THE COMPANIES ORDINANCE, 1984

[SECTION 205]

FORM 29

1. Incorporation Number

2. Name of Company

3. Fee Paid (Rs.)

4. Receipt No.

5. Mode of Payment (Indicate)

6. Particulars:

6.1. New Appointment/Election

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointment / change / any other remarks (i)
Makhdum Omar Sheryar	42301-9726732-7	S/O Makhdum Rukan-ud-Din	117/2/1, Khayabane-e-Bukhari, DHA-V1, Karachi Sindh Pakistan 74200	Director	Pakistan		Since Incorporation.	
Mr. Munir Hussain	35202-2570641-7	S/O Mr. Nazir Hussain	178-Nishtar Block, Allama Iqbal Town, Lahore Punjab Pakistan 54000	Director	Pakistan		Since Incorporation.	
Mrs. Bilqees Fatima	35202-2285580-8	W/O Mr. Munir Hussain	178-Nishtar Block, Allama Iqbal Town, Lahore Punjab Pakistan 54000	Director	Pakistan		Since Incorporation.	
Mrs. Naseem Javid	35202-5643424-0	W/O Mr. M. Sadiq Javed	H. No. 5-Q/A, Gulberg 11, Lahore Punjab Pakistan 54880	Director	Pakistan		Since Incorporation.	
Mrs. Riffat Zaman	31303-7348087-2	W/O Makhdum Rukan-ud-Din	Mianwali Qureshi, P. O. Rhas, District and Tehsil Rahim Yar Khan Punjab Pakistan 64200	Director	Pakistan		Since Incorporation.	
Mrs. Tehmina Sadiq Javid	42301-3018474-8	W/O Makhdum Omar Sheryar	117/2/1, Khayabane-e-Bukhari, DHA-V1, Karachi Sindh Pakistan 74200	Director	Pakistan		Since Incorporation.	

6.2. Ceasing of Officer/Retirement/Resignation

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointment / change / any other remarks (i)

6.3. Any other change in particulars relating to columns (a) to (g) above

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointment / change / any other remarks (i)

Name of Signatory

Makhdum Omar Sheryar

Designation

Director

Signature of Chief Executive/Secretary

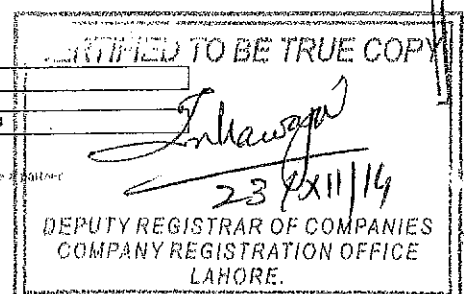
Date (DD/MM/YYYY)

18/11/2014

In the case of a firm, the full name, address and above mentioned particulars of each partner, and the date on which each became a partner.

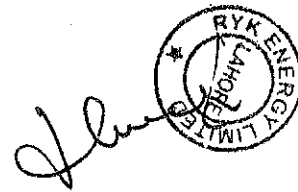
In case the nationality is not the nationality of origin, provide the nationality of origin as well.

When a mode of payment is indicated, the Director is to be satisfied.



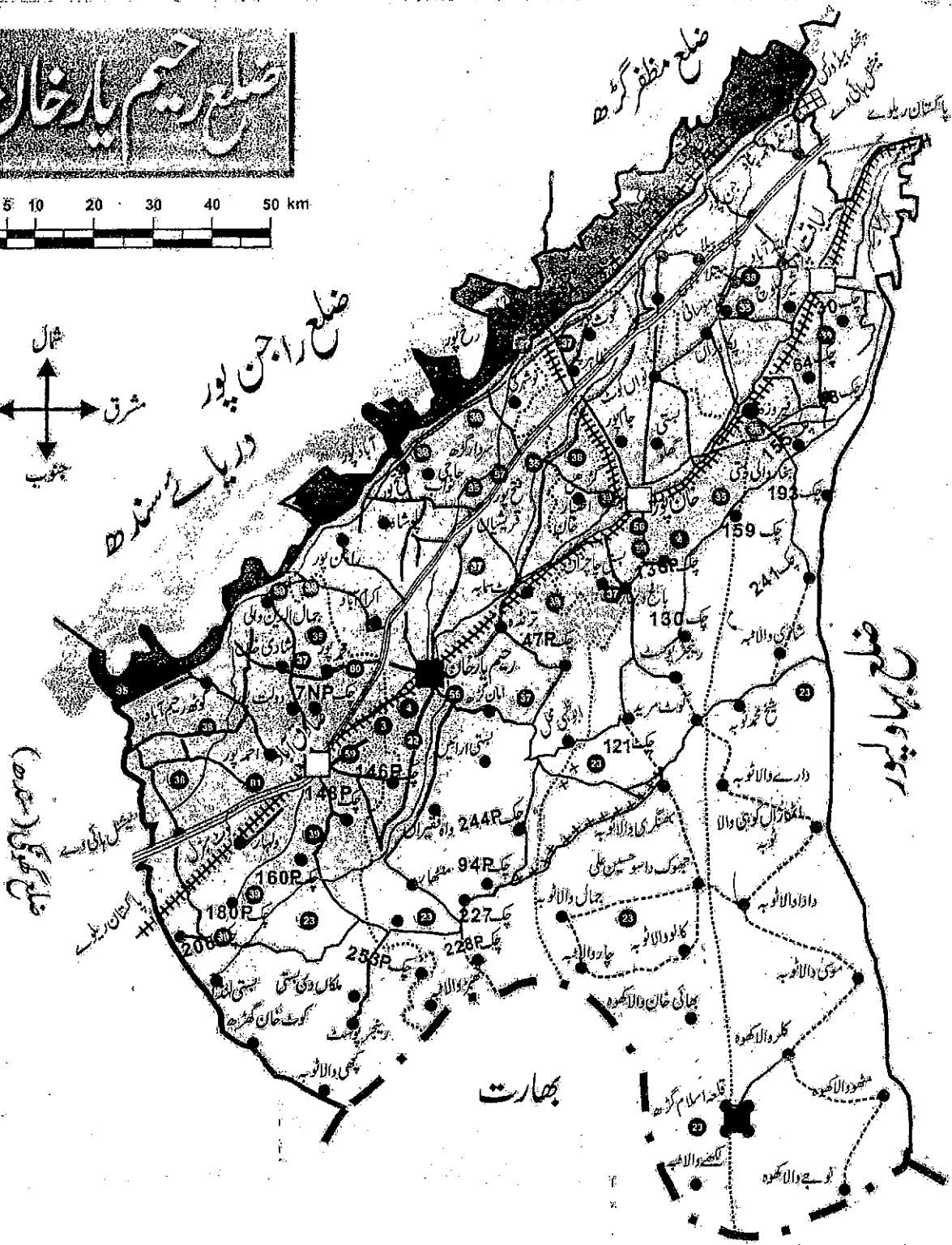
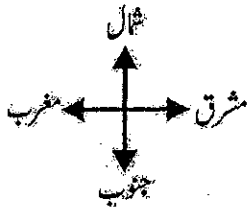
Schedule-1

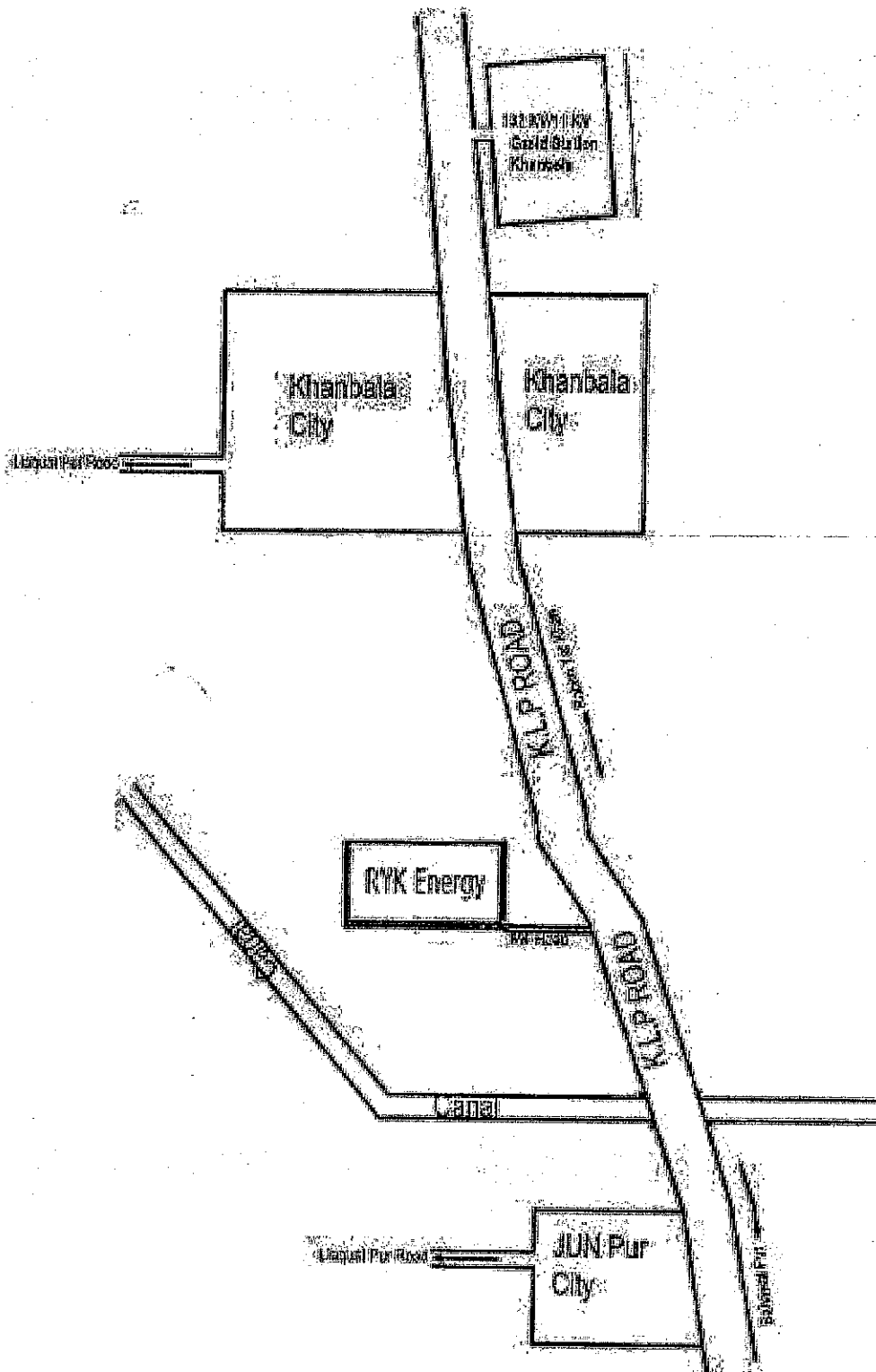
The Location, Size (capacity in MW), Type of Technology, Interconnection Arrangements, Technical Limits, Technical/Functional Specifications and other details specific to the Generation Facilities of the Licensee are described in this Schedule.

A handwritten signature in black ink is written over a circular stamp. The stamp contains the text "RYK ENERGY LIMITED" around the top and "LAHORE" in the center, with a small star symbol on the left side of the circle.

ضلع رحیم یار خان

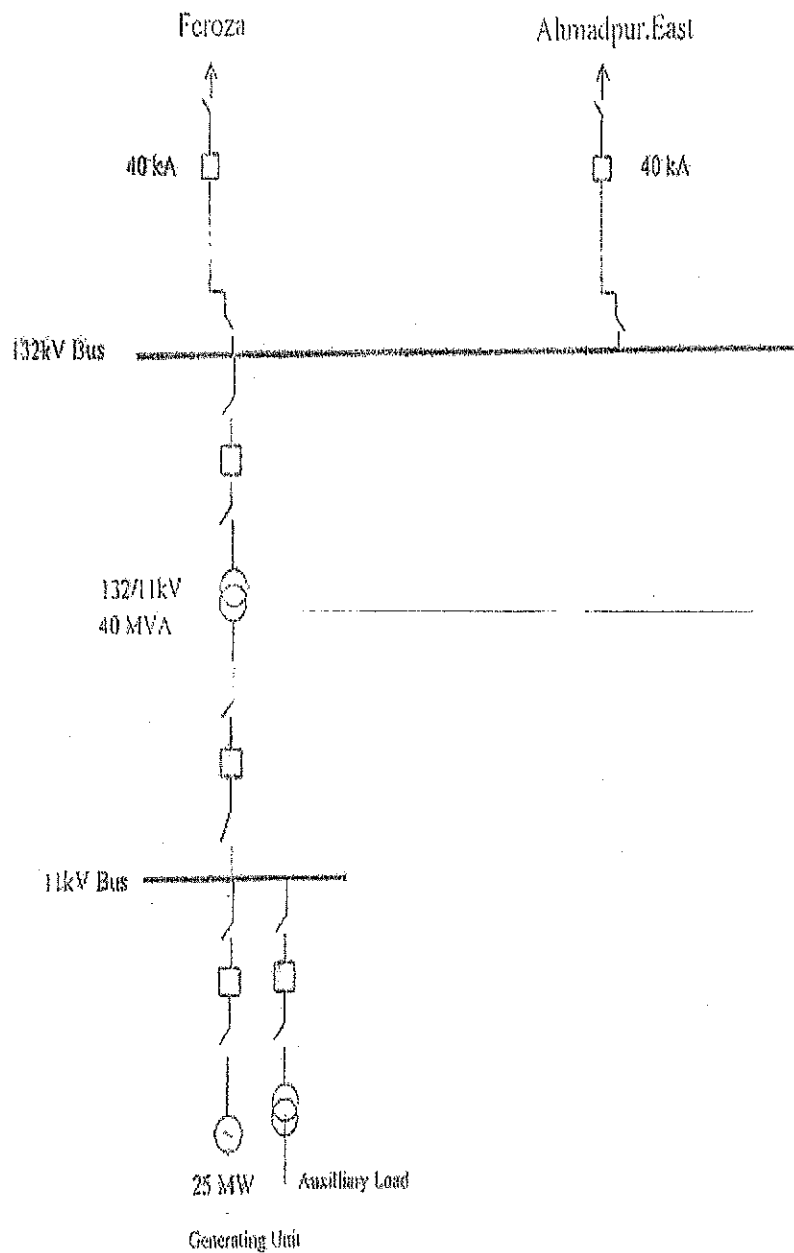
km 0 5 10 20 30 40 50 km





[Signature]

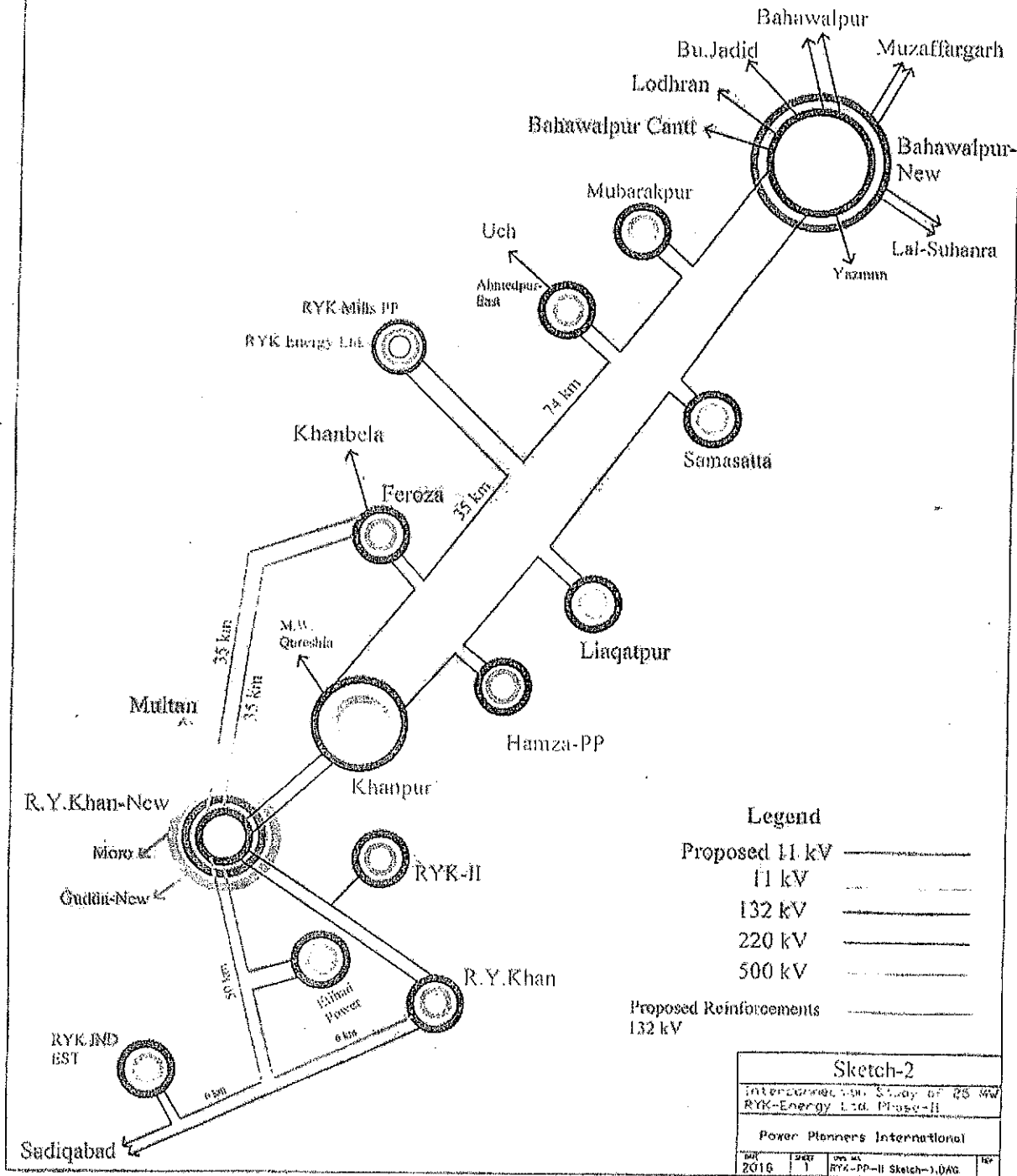
Single Line Diagram of 132/11 kV Busbar At RYK-PP-II



SUD-1				
Thermal Power Plant at RYK-PP-II				
Power Plant Characteristics				
Year	Unit	Capacity	Rating	AD
2016	1	25 MW	25 MW	AD



Network Around Proposed Site of RYK-Energy Ltd. PP (with RYK-Energy Ltd. Unit, Year 2018)

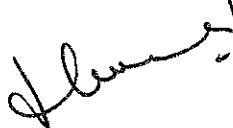



**INTERCONNECTION / TRANSACTION ARRANGEMENT FOR THE
DISPERSAL OF POWER FROM THE POWER PLANT**

The Power generated by RYK Energy Limited (RYKEL) from its Bagasse based Thermal Power Generation facility shall be dispersed to the Load center of Multan Power Company Limited (MEPCO).

The Interconnection/Transmission Arrangement for the above mentioned facilities will be at 132 KV voltage under the Framework for Power Co-generation, 2013 (Bagasse/Biomass) approved by the ECC of the cabinet in March 2013.

The final Interconnection and Transmission Arrangement(s), for the dispersal of power, as agreed by RYKEL and MEPCO' shall be communicated to NEPRA in due course of time.

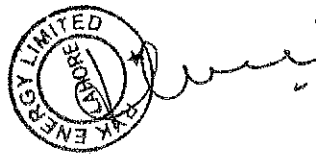
Plant Details*

General Information

1	Name of Applicant	RYK Energy Limited
2	Registered/Business Office	75/4 D- Sarfraz Rafiqui Road, Lahore Cantt
3	Plant Location	Janpur, Tehsil Liaquat pur, District Rahimyar Khan, Punjab
4	Type of Generation Facility	Bagasse Fired Thermal Power Station

Plant Configuration

1	Plant Size Installed Capacity (Gross ISO)	25 MW
2	Type of Technology	Steam Turbine
3	Number of Units/Size (MW)	01 Unit 25 MW
4	Unit Make & Model	HTC, SKODA, SIEMENS etc.
5	Commissioning/Commercial Operation Date	July 31, 2018
6	Expected Life of the Units of Facility from Commercial Operation/Commissioning Date	30 years
7	Expected Remaining useful Life of the Units of the Facility	30 years



Fuel/Raw Material Details

1	Primary Fuel	Bagasse		
2	Alternate Fuel	Furnace Oil (FO)		
3	Fuel Source (Imported/Indigenous)	Primary Fuel	Alternate Fuel	
		Indigenous	Imported/Indigenous	
4	Fuel Supplier	Primary Fuel	Alternate Fuel	
		RYK Mills Limited	Shell Pakistan Ltd/PSO	
5	Supply Arrangement	Primary Fuel	Alternate Fuel	
		Through Conveyor Belts / Loading Trucks / Tractor / Trolleys etc	Through Oil Tankers	
6	Sugarcane Crushing Capacity	12000 Tons/Day		
7	Bagasse Generation Capacity	3840 Tons/Day		
8	Bagasse Storage Capacity	150000 Tons Bagasse		
9	No. Of Storage Tanks	Bagasse	FO	
		Bulk Storage	2	
10	Storage Capacity of Each Tank (Tons)	Bagasse	FO	
		Bulk Storage	Tank-1	Tank-2
			500	40
11	Gross Storage (Tons)	Bagasse	FO	
		Bulk Storage	540	

Emission Values

1	SO _x	Bagasse	FO
		0 %	To be provided later
2	NO _x	Bagasse	FO
		2 ~ 5 %	To be provided later
3	CO ₂	Bagasse	FO
		12 % ~ 13 %	To be provided later
4	CO	Bagasse	FO
		2 % ~ 3 %	To be provided later
5	PM ₁₀	Bagasse	FO
		Nil	To be provided later



Cooling System

1	Cooling Water Source/Cycle	Condensate water of Ground Water Turbine installed at plant site / Closed Loop
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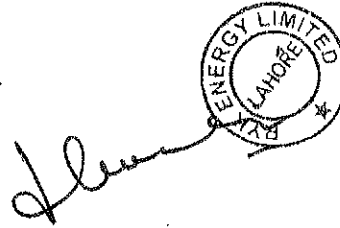
Plant Characteristics

Unit 1		
1	Generation Voltage	11 KV
2	Frequency	50 Hz
3	Power Factor	0.8 Lagging - 0.9 Leading
4	Automatic Generation Control(AGC)	Yes
5	Ramping Rate	4 KW / Sec
6	Time required to synchronizing to Grid and Loading the Complex to full load.	5 Hrs. for cold start / 30 seconds for synchronizing to Grid



SCHEDULE II

The Installed/ISO Capacity (MW), De-Rated Capacity at Mean Site Conditions (MW), Auxiliary Consumption (MW) and the Net Capacity at Mean Site Conditions (MW) of the Generation Facilities of Licensee is given in this Schedule.

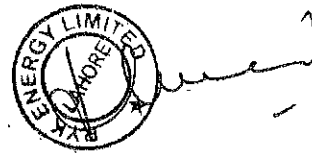
A handwritten signature in black ink is written over a circular stamp. The stamp contains the text "RYK ENERGY LIMITED" around the top inner edge and "LAHORE" around the bottom inner edge, with a small star symbol at the bottom.

SCHEDULE-II

1	Installed Capacity Gross ISO	25MW
2	De-rated capacity	25MW
3	Auxiliary Consumption	2.2MW
4	Net Capacity of the Plant	22.8MW

Note

All the above figures are indicative as provided by the license. The Net Capacity available to MEPCO for dispatch will be determined through procedure(s) contained in the Bi-lateral Agreement(s), Grid code or any other applicable document(s).



FEASIBILITY REPORT REQUIRED
UNDER REGULATION 3.5 (H) OF
NATIONAL ELECTRIC POWER
REGULATORY AUTHORITY
LICENSING (APPLICATION AND
MODIFICATION PROCEDURE)
REGULATIONS, 1999



PLANT DETAILS

1. Type, Technology, Model, Technical Details And Design Of The Facilities

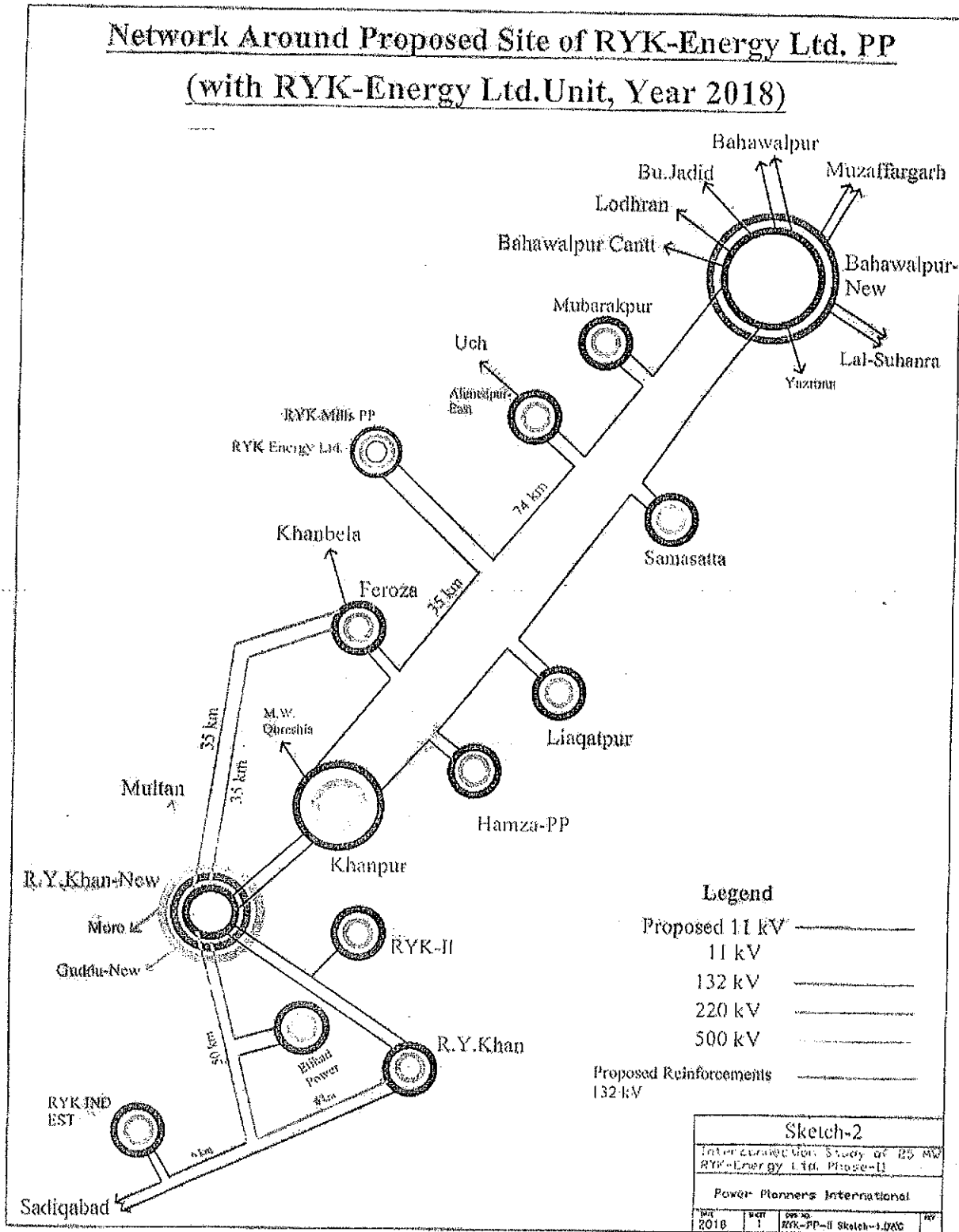
(i)	Type of Generation Facility	Bagasse Fired Thermal Power Station
(ii)	Type of Technology	Steam Turbine
(iii)	Unit Make and Model	HTC, SKODA, SIEMENS etc.
(iv)	Plant Size Installed Capacity (Gross ISO)	25 MW
(v)	Number of Units	01 Unit
(vi)	Installed Capacity	25 MW
(vii)	Auxiliary Consumption	2.2 MW
(viii)	Generation Voltage	11 KV
(ix)	Frequency	50 Hz
(x)	Power Factor	0.8 Lagging - 0.9 Leading
(xi)	Automatic Generation Control (AGC)	Yes
(xii)	Ramping Rate	4 KW / Sec
(xiii)	Time Required to Synchronize to Grid and Loading the Complex to Full Load from Cold Start	5 Hrs. for cold start / 30 seconds for synchronizing to Grid

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).

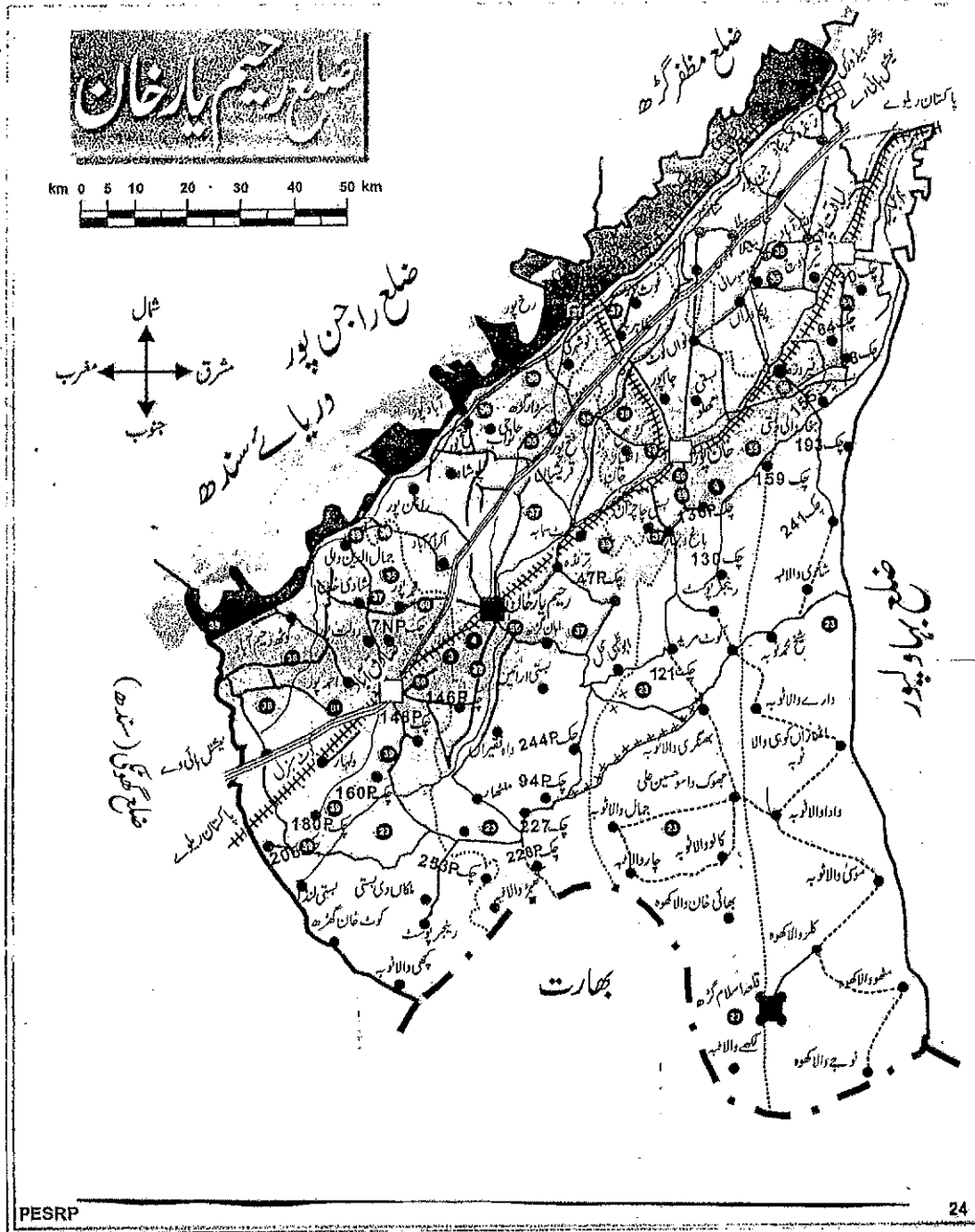


(xiv) Proposed Generation Facility





3. Map of District Rahim Yar Khan



4. SALIENT FEATURES OF THE FACILITY FOR WHICH LICENSE IS SOUGHT

The Facility shall employ 25MW Steam Turbo Generator (STG) for power generation which shall be dispatched to the National Grid through existing 132 KV network which is already constructed for RYK Mills Limited. Electricity from this Facility shall be connected to the National Grid by looping in-out of the double circuit of the Feroza to Ahmedpur East 132KV line.

(i)	Plant location	On Main K-L-P Road (National Highway) at Rukanabad (Janpur), Tehsil Liaqatpur, District Rahim Yar Khan, Province of Punjab
(ii)	Plant Capacity	25MW (Gross) – 22.8MW (Net)
(ii)	Technology	Conventional steam power cycle
(iv)	Installed capacity	25,000 KW
(v)	Plant detail	
	i. Steam Turbo generators	1 X 25 MW Steam Turbo Generator (STG)
	ii. Boiler	1X170 TPH 67 Bar(a) Dumping grate bagasse fired 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.

5. Expected Life Of The Facility

(i)	Expected Life of the Units of Facility from Commercial Operation/Commissioning Date	30 years
(ii)	Expected Remaining useful Life of the Units of the Facility	30 years

6. Expected Commercial Operation Date

(i)	Commissioning/Commercial Operation Date	July 31, 2018
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7. Cooling System

(i)	Cooling Water Source/Cycle	Condensate water of Ground Water Turbine installed at plant site / Closed Loop
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8. Infrastructure

The road and infrastructure can be subdivided as:

- **Main highway**
RYK Energy Limited can be access from the Main K-L-P Road which passes from the Main gate
- **Railway Station**
The nearest railway station is Liaquat pur station which is at the distance of around 20-25km from the mills
- **Airport**
Rahimyar khan International Airport and Bahalpur International Airport which are around 100kms away
- **Hospital**
Nearest hospital is at Khan Bela which is approximately 08kms away towards South
- **Nearest City**
Nearest city is Khan Bela which is approximately 08kms away towards South



Infrastructure

The road and infrastructure can be subdivided as:

Main highway

RYK Energy Limited can be access from the Main K-L-P Road which passes from the Main gate

Railway Station

The nearest railway station is Liaquat pur station which is at the distance of around 20-25km from the mills

Airport


Rahimyar khan International Airport and Bahalpur International Airport which are around 100kms away

Hospital

Nearest hospital is at Khan Bela which is approximately 08kms away towards South

Nearest City

Nearest city is Khan Bela which is approximately 08kms away towards South



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**

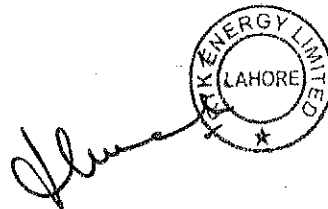
The Emergency response Team shall be responsible to ensure immediate shutdown of the operational systems and equipments if required in the Emergency.

○ **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 at the facility shall be ensured for causality evacuation to the hospitals.

A handwritten signature in black ink is written over a circular stamp. The stamp contains the text "RYK ENERGY LIMITED" around the top inner edge and "LAHORE" in the center, with a small star at the bottom.

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, leather apron, leather sleeves, face shield, 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 along with fire suppression system at all fire hazardous locations of the plant site especially at transformers & turbine lube oil systems etc.

○ **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 and necessary staff to provide urgent and immediate first aid facilities will be ensured at the facility.

○ **Ambulances**

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

○ **Mock Fire Drills**

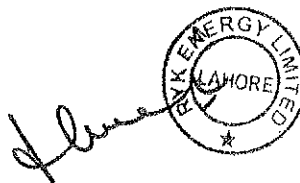
To keep fire brigade staff in good practice, mock fire drill will be executed by creating mock emergency situations.

○ **Fire Fighting System**

The fire protection system 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 and all such systems for various areas shall form a part of a centralized protection system for the entire plant.

- The complete fire protection system shall comprise of following;
- Stand pipe & hose system for building and structure (internal)
- Yard main, hydrants and monitors of plant site (external)
- Fire alarm and signaling
- Portable fire extinguishers
- Water spray fixed systems

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 High Tension turbines Operation
15. Understand H.P Boiler starts up and Shut Down
16. Understand Turbine start up and operations
17. Understand High Voltage Equipments
18. 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.

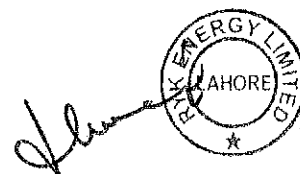
Benefits of this training and development programme

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

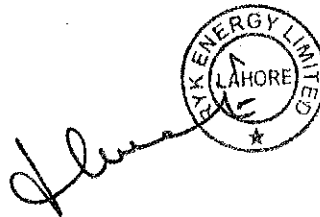
The awareness of possible dangers in the plant and the safe operation of any equipment is essential. Training ensures a full understanding of the plant and its systems functionality and proper handling in order to prevent any hazards and threats.

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

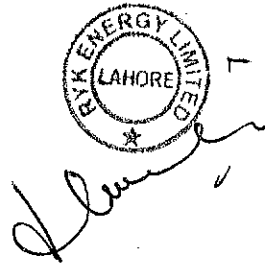
A well defined training concept with continuous skill development programs and clear learning targets will guarantee satisfying performances of your personnel. This long term approach will ensure the successful productivity of your power station.

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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 boilers, extraction condensing turbo generators, 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.

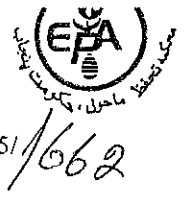
A circular stamp of RYK ENERGY LIMITED LAHORE is visible, with a signature written over it. The stamp contains the text "RYK ENERGY LIMITED" around the top and "LAHORE" in the center, with a small star at the bottom. The signature is a cursive script, likely of a company representative.



ENVIRONMENT PROTECTION DEPARTMENT

Government of the Punjab
National Hockey Stadium, Lahore.

NO. DD (EIA)/EPA/F-948(IEE)/2406/2015/
Dated: 25/10/2016



To ✓

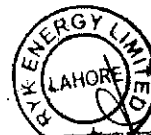
Mr. Munir Hussain,
Director,
M/s RYK Energy Limited,
Rukan Abad, Janpur,
Tehsil Liaquatpur District Rahim Yar Khan.

Subject:

DECISION OF EPA PUNJAB FOR THE PROJECT "INSTALLATION OF 36 MW BAGASSE FIRED CO-GENERATION POWER PLANT AT MAIN KLP ROAD, JANPUR IN TEHSIL LIAQATPUR DISTRICT RAHIM YAR KHAN"

1. Description of Project: Installation of 36 MW Bagasse Fired Co-generation Power Plant.
2. Location of Project: KLP Road, Janpur, Tehsil Liaquatpur District Rahim Yar Khan.
3. Date of filing of EIA: 03.11.2015
4. EPA Punjab has reviewed the Initial Environmental Examination Report (IEE) and considered Site Inspection Report received from District Officer (Environment), Rahim Yar Khan vide letter No. 2251/DOE/RYK dated 25.11.2015. EPA Punjab has also considered the recommendations of Committee of Experts (Meeting dated 26.05.2016), recommendations of EA Committee (Meeting dated 24.06.2016) and other relevant record.
5. Environmental Protection Agency, Punjab accords approval for the aforesaid project subject to the following conditions:
 - i. The proponent shall install new and state of the art systems, machinery, equipment, instruments that are most efficient and latest in their development cycles.
 - ii. The proponent shall comply with the Punjab Environmental Quality Standards (PEQS) by installing appropriate pollution control equipment and/or treatment plants where necessary.
 - iii. The proponent shall submit detailed modeling study of emissions to ensure PEQS compliance with respect to both emission and ambient air standards within the reach of the emitted pollutants before commencement of the project.
 - iv. Mitigation measures suggested in the Environmental Management and Monitoring Plan (EMMP) of the IEE shall be strictly adhered to. The proponent shall detail expert(s) to monitor, ensure, and report compliance of the EMMP.
 - v. Monitoring shall be carried out during the entire period of the project activities. Monitoring reports of the whole operation shall be submitted to EPA, Punjab on monthly basis.
 - vi. The proponent shall install online air pollution monitoring analyzers for regulated pollutants like particulate matter, CO, SO₂, NO_x, HC, and Mercury and provide EPA Punjab continuous online access to these analyzers. Additionally the proponent shall also provide a mobile ambient air quality monitoring station for monitoring of pollution due to the project at points of peak concentrations on the ground in the vicinity of the project.
 - vii. The proponent shall ensure that the project, when operational, is in full compliance of Minamata Convention for control of mercury emissions.
 - viii. The proponent shall install wastewater treatment plant and shall dispose of the treated wastewater in compliance with PEQS and submit the relevant NOC for discharge of disposal of waste
 - ix. The solid waste shall be retained within the unit boundary / premises and shall be disposed of in environment friendly way at a designated disposal facility.
 - x. The proponent shall submit detailed plan for handling and ultimate disposal of fly ash generated before operational phase.
 - xi. The proponent shall ensure that strict and efficient health and safety measures are in place for protection of the workers in case of any environmental emergency and these measures are backed by a comprehensive emergency response system.
 - xii. The proponent shall take measures for storage of fuel as per the governing law.

P.T.O



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Environmental Consultancies & Options

RYK ENERGY LIMITED

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

"INSTALLATION OF 36 MW BAGASSE FIRED COGENERATION POWER PLANT"

09/10/2015

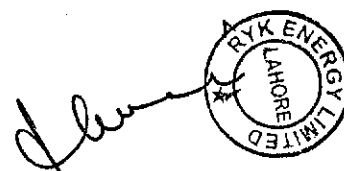


RYK Energy Limited

Rukan Abad, Janpur, Tehsil Liaquatpur,

District

Rahim Yar Khan



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EXECUTIVE SUMMARY

THE TITLE AND THE LOCATION OF THE PROPOSED PROJECT

RYK Energy Limited is currently in the process of setting up a 67 Bar High pressure bagasse based co-generation power project having 36 MW gross capacity under the Policy Framework for Power Cogeneration 2013 for Bagasse / Biomass to include bagasse / biomass under the ambit of the Renewable Energy Policy, 2006. The proposed project spill over capacity will be 19MW. The project will be situated adjacent to the company's sugar mill.

INTRODUCTION OF THE PROPONENT

RYK Energy Limited, a public (unlisted) company, owns and operates 13,000 TCD sugar mill with 30 MW power house. The mill is located at Janpur, district Rahim Yar Khan. The company commenced commercial operations in December 2008. The company is engaged in the manufacturing and sale of sugar (including by-products such as molasses), and the generation and sale of 30MW (Gross) electricity to the National Grid. The company produces power through burning of bagasse, a waste product from sugarcane processing, to meet its captive requirements.

INTRODUCTION OF THE COMPANY (CONSULTANT) PREPARING THE REPORT

RYK Energy Limited has engaged Environmental Consultancies and Options (ECO) to conduct an initial environmental examination (IEE) of the proposed project. This document presents IEE report having a comprehensive environmental management plan (EMP) for the construction & operational phase of the proposed project.

The objectives of the proposed project are as follows:

- To generate cleaner, economical and reliable energy from indigenous biomass fuel
- To boost agriculture sector of Pakistan
- To save millions of dollars which are wasted to import expensive oil to be used as fuel for producing electricity

- To maintain long-term viability of sugar sector
- To reduce environmental hazards caused by burning furnace oil as fuel for producing electricity.

A BRIEF OUTLINE OF THE PROPOSAL

The study has been conducted using standard environmental assessment methodology in accordance with national and international environmental guidelines. The study evaluates the proposed project according to the Environmental Impact Assessment (EIA) requirements established by Environmental Protection Agency (EPA). An Environmental Assessment Checklist methodology was adopted to identify the high risk activities and to suggest their relevant mitigation measures. Where possible, eliminating the risk by altering the scope or method of execution of work was preferred rather than minimizing the risk with control measures. Questionnaire was designed to conduct social survey of the project area. Environmental monitoring was carried out for ambient air quality monitoring, water, wastewater and soil analysis. The contents of this report conform to the environmental guidelines of the EPA Pakistan.

ENVIRONMENTAL SETTING

RYK Energy Limited plans to install 36 MW Bagasse Cogeneration Power Plant at Rukan Abad, Janpur, Tehsil Liaquatpur, District, Rahim Yar Khan. The total area for proposed project site is 10 acres. The major locations around the project site are Malik Murad on east, Basti Parara on west, Motha Brodery on north, Basti Parrva (Padva) on south.

Rahim Yar Khan is one of the modern district headquarter cities in Punjab. Rahim Yar Khan is a commercial and industrial centre; it is connected with the rest of the country through rail and air including the other industrial hubs such as Lahore, Karachi, Quetta and Faisalabad. Industries include fertilizer, cosmetics, glass manufacturing, cotton production and processing, large textile units, flour mills, sugar and oil mills and large-scale power generation projects. Cotton production in Punjab Province starts from this area. Mango and Malta are two main fruits of this city. Cottage industries include ginning, pottery/clay products, agricultural machinery, handicrafts, and embroidery. District Rahim Yar Khan has a very hot and dry climate in summer. The maximum temperature touches 49.7 °C. The minimum temperature recorded is 6.8 °C. The average annual rainfall in the

district is 165 mm.

Plantation, grasses and shrubs along road, rail, canal and river side exist. Similarly, in general, trees, grasses and shrubs exist on the cultivable land. The land is fertile. Major cash crops include sugar cane, cotton, wheat and pulses. The area has many public and private hospitals. Government Hospital is present in Khan Bela. Social Security Hospital and dispensary is present in Rukanabad of Rahim Yar Khan.

MAJOR ENVIRONMENTAL IMPACTS AND MITIGATIONS

The potential adverse impacts associated with the proposed project field development activities may include: Physical scarring (caused by the clearing and leveling of land); Land slippage and soil erosion; soil condemnation; air pollution; noise and disturbance; loss of vegetation and habitats; hazard to population; and the influx of work force.

Land clearing and leveling may increase the risk of land slippage and soil erosion. Minimizing the vegetation loss can reduce this risk. The spillage and leakage of fuel, oils and other chemicals may lead to soil contamination. Possible contaminant sources include fuel, oil and chemical storage area, at site and vehicles and machinery used at the site.

Water resources are available within the project area and the water needs shall be met through tube wells and by the local water supply.

The ambient air quality of the area can be affected by exhaust emissions from the generators at the site, vehicles and other construction equipment. In addition the kicked up dust can also cause deterioration in the air quality of the area in the immediate vicinity of the activities. To reduce these impacts, the maximum possible distance will be kept from settlements and vehicle speed will be reduced on roads passing through or close to them.

To mitigate the project impacts of the biological resources of the area, the following measures will be incorporated into its design:

- Construction camps and equipment stores will be located at appropriate places.
- Construction activity may take place at night, keeping in consideration the minimization of noise and vibration level.
- Generated waste will be properly disposed.

Chapter - 1

INTRODUCTION

- Vehicular movement will be carefully carried out through already set safety procedures.
- Effluent will be properly treated in the effluent treatment plant, thus no contamination is envisaged.
- Vegetation loss will be kept to absolute minimum large bushes and dense vegetation will be avoided.
- Fires in the open will not be allowed.
- A "no-hunting, no trapping, no harassing" policy will be strictly enforced.

PROPOSED MONITORING

Regarding the proposed project, regular environmental monitoring would be carried out either through the third party or through EPA certified laboratories. The monitoring reports would be shared with EPA on regular basis. Whereas, the industry may hire any consultant to carry out regular environmental audits to ensure the complete compliance with the mitigational measures devised in this report.

CONCLUSION

After assessing the proposed project activities and investigating the project area, the environmental consultants, Environmental Consultancies and Options (ECO) have concluded that:

"If the activities are undertaken as proposed and described in this report, and the recommended mitigation and environmental management measures are implemented/adopted, the project will not result in any long-term or significant impacts on the local community or the environment".

Chapter - 1

INTRODUCTION

1.1 RYK Energy Limited-The Proponent

RYK Energy Limited, a public (unlisted) company, owns and operates 13,000 TCD sugar mill with 30 MW power house. The mill is located at Janpur, district Rahim Yar Khan. The company commenced commercial operations in December 2008. The company is engaged in the manufacturing and sale of sugar (including by-products such as molasses), and the generation and sale of 30MW (Gross) electricity to the National Grid. The company produces power through burning of bagasse, a waste product from sugarcane processing, to meet its captive requirements.

1.2 Importance of Energy Production

Energy is considered to be the life line of an economy, the most vital instrument of socioeconomic development and has been recognized as one of the most important strategic commodities. Energy is not only essential for the economy but its supply is uncertain. Energy is a strategic source that influenced the outcomes of wars, fueled and strangled economic development and polluted as well as clean up the environment.

Pakistan's energy infrastructure is under-developed, insufficient and poorly managed. Presently Pakistan has been facing severe energy crisis. Despite strong economic growth and rising energy demand during the past decade, no serious efforts have been made to install new capacity of generation. Consequently, the demand exceeds supply and hence load-shedding is a common phenomenon through power shutdown. Pakistan needs around 14,000 to 15,000 MW electricity per day, and the demand is likely rise to approximately to 20,000 MW per day. Presently, the shortfall is about 3000 to 4000 MW per day. This shortage is badly affecting industry, commerce, daily life and posing risks to the economic growth.

1.3 Principle Business Premises

Head office: 75 / 4-D, Sarfraz Rafiqui road, Lahore Cantt.

Proposed Site: RYK Energy Limited Rukan Abad, Janpur, Tehsil Liaqatpur, District Rahim Yar Khan.

1.4 Environmental Management Activities

RYK Energy Limited gives priority towards safety, security, health and environment and it meets or exceeds the local regulatory requirements. In order to comply with legal requirements initial environmental examination has been carried out for the proposed project site.

RYK Energy Limited is committed to ensure that all operations are carried out with due regard for environmental protection and to meet legal requirements.

1.5 Details of Consultant

The ECO is a professionally run, engineering and consultancy firm with strong backup of highly qualified, experienced personnel. The company has specialized diversified fields and continuously identifying the current and future demands related to environment and engineering. The ECO has evolved into a technologically robust conglomerate with manufacturing interests in Metallurgy, Specialty Chemicals, Oil Field Chemicals and Water and Wastewater Treatment and Alternate Energy. The ECO is serving market niche with a broad range of high technology products and services to a wide spectrum of industries in Pakistan. Environmental Consultancies and Options is a member of Groups of Companies. The other members are:

- ☐ Global Waste Management (GWM)
- ☐ Global Environmental Laboratories (GEL) [ISO 9001:2000 Certified]
- ☐ Global Technologies (GT)

1.6 Purpose of the Report

RYK Energy Limited has devised Mission to achieve certain environmental objectives besides the existing local legal requirements. Consultants hereby were hired for providing Consultancy for carrying out Initial Environmental Examination (IEE) and the purpose of report is for obtaining Environmental Approval from EPA.

1.7 Overview of Activities for the Proposed Project

RYK Energy Limited, a public (unlisted) company, owns and operates 13,000 TCD sugar mill with 30 MW power house. The mill is located at Janpur in district Rahim Yar Khan. The company is currently in the process of setting up a 67 Bar High pressure bagasse based co-generation power project having 36 MW gross capacities under the Policy Framework for Power Cogeneration 2013 for Bagasse / Biomass to include bagasse / biomass under the ambit of the Renewable Energy Policy, 2006. The proposed project spill over capacity will be 19MW. The project will be situated adjacent to the company's sugar mill.

The Project shall utilize the company's self-generated bagasse as the sole fuel. Bagasse shall be fired in high pressure boiler to produce steam to generate electricity.

1.8 Project Area & Location

The bagasse based power project shall be installed adjacent to RYK Energy Limited which is located on the main K-L-P (National Highway) road at Janpur in Tehsil Liaquatpur, District Rahim Yar Khan, Punjab Province (the "Site").

The proposed project area of land:

Total Area (Acres)	Structured Area (Acres)	Plain Area (Acres)
10	2	8

1.9 Project Cost

The estimated cost for the installation of the proposed project would be US \$ 35.262 Million.

1.10 Project Duration

The estimated project duration for the installation of the proposed project would be 12-14 months.

1.11 Estimated Labor Requirement

The estimated labor requirement in installation and operational phase of the proposed project would be 50 and 30 people respectively.

1.12 Environmental Management Plan Cost

The Environmental Management Plan should be implemented to enhance the project benefits. The estimated EMP cost is one hundred thousand PKR.

1.13 Project Location

As has been mentioned in the above section the proposed project location would be adjacent to the existing sugar mill. For further information the map of the project location has been attached as **Annex N**

Chapter - 2

SCOPE & METHODOLOGY

Chapter - 2

SCOPE AND METHODOLOGY

2.1 Initial Environmental Examination

“Initial Environmental Examination” (IEE) means a preliminary environmental review of reasonably foreseeable qualitative and quantitative impacts on the environment of the proposed project.

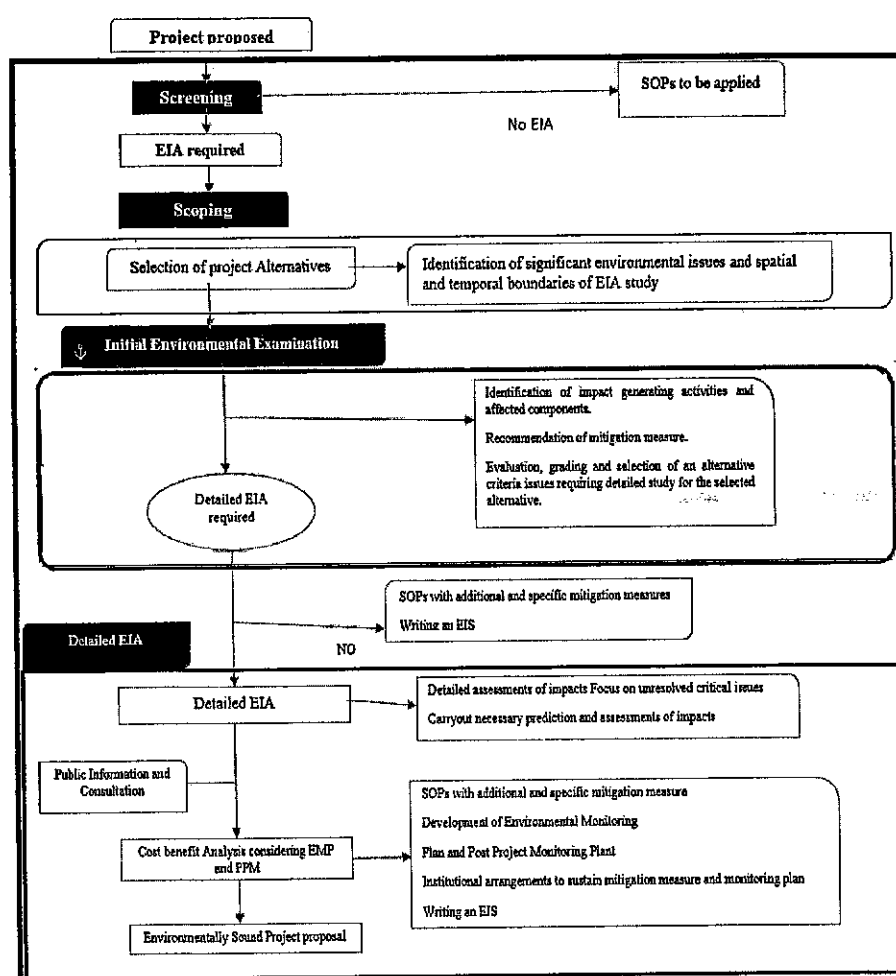


Figure 2.1: Flow Diagram of IEE

2.2 Objectives of IEE

The objectives of IEE are as follows:

- To identify the regulatory requirements relevant to the proposed project which is to be carried out by RYK Energy Limited
- To assess the existing environmental and socioeconomic conditions in the project area.
- To assess the potential environmental or socioeconomic impacts of project activities and identify issues of concern.
- To propose mitigation and monitoring measures that can be incorporated into the design of the project to remove or reduce any damaging effects as far as possible, and to control and monitor residual impacts.
- To assess the proposed activities to ensure that they comply with the relevant environmental and social regulations and standards, and
- To prepare an IEE report for submission to concerned Environmental Protection Agency (EPA).

2.3 Scope of IEE

This Initial Environmental Examination (IEE) covers the intended field development activities and associated activities at RYK Energy Limited. The scope of the IEE includes:

- Development of site
- Servicing operations
- Waste generation and disposal
- Cleanup and restoration of the construction locations and the project site

2.4 Approach & Methodology

The activities were discussed with the proponent RYK Energy Limited and the preliminary information was obtained. The site was visited for collection of required information. Questionnaire was designed to collect data for social assessment of the area.

2.4.1 Scoping / Data Collection

In this step, information relating to the physical, technical and environmental parameters was collected from the Client and other agencies such as IUCN, EPA, SUPARCO and Development Directorates, etc. Local inhabitants were interviewed in order to understand the socio-economics, culture and customs of the area. An extensive literature review was also carried out at this stage.

Following information was collected:

- Details of project activities
- Legislative obligations
- Environmental data through physical survey. Following data was collected through field visits and secondary data available with various agencies:

Physical Surveys:	Technical Surveys:
<ul style="list-style-type: none">• Proposed environmental study area• Climatology• Topography and Geology• Hydrology and Hydrogeology• Ecology, flora and fauna• Socio - economic conditions• Sensitive Areas• Land use patterns	<ul style="list-style-type: none">• Process details• Utilities availability• Effluent Generation• Air Emissions• Solid waste generation• Transportation mechanisms• Storage of chemicals & hydrocarbons

2.4.2 Data Analysis

The data collected in step-1 was analyzed in the framework of Pakistan Environmental Protection Act, 1997 and the Guidelines on Operational Safety, Health.

2.4.3 Initial Environmental Examination (IEE)

The data collected in previous phases were used to investigate existing environmental conditions and assess the potential impacts of the proposed activities. Although the major

emphasis remained on the compliance of the client's operation with the national legislation, internationally available guidelines were reviewed and mitigations were indicated to ensure environmentally safe practices.

2.4.4 Initial and Final Environmental Examination (IEE) Report

The findings of the study are communicated to the client in the form of a draft Initial Environmental Examination (IEE) Report. The report has been prepared in accordance with the relevant guidelines of the Pakistan Environmental Protection Agency.

The discussion and comments of the client regarding the recommendations by the consultants were considered and appropriate modifications were incorporated in the draft report to be presented as a Final Report.

2.5 Report Organization

The Initial Environmental Examination Report (IEE) has been organized into eight (08) Chapters.

Chapter-1: Describes the activities of the project proponents and provides a brief description of the project location.

Chapter-2: Describes the Scope and Methodology of this IEE.

Chapter-3: Is an overview of national and international legislation and guidelines relevant to project activities and the initial environmental examination process.

Chapter-4: Describes in detail the project activities.

Chapter-5: The environmental setting of the project area is discussed in this Chapter.

Chapter-6: Deals with the project impacts, mitigation and alternatives.

Chapter-7 Is an Identification of possible impacts for preparation of Environmental Management Plan (EMP) if necessary.

Chapter-8: Is the conclusion of the Initial Environmental Examination.

Chapter - 3

LEGAL FRAMEWORK

Chapter – 3

LEGAL FRAMEWORK

A number of laws exist in Pakistan, containing number of clauses concerning protection of the environment. However, the first legislation on environmental protection was issued in 1983. The Pakistan Environmental Protection Ordinance, 1983 was the first legislation promulgated for the protection of environment. Pakistan Environment Protection Agency was established in 1984. No significant environmental policy, guidelines and regulations were carried out till early 1990's. The National Conservation Strategy was developed and approved by the federal cabinet in 1992. Provincial Environmental Protection Agencies were also established in 1992-1993. National Environmental Quality Standards (NEQS) were established in 1993. Detailed environmental guidelines started in 1996. The National Assembly and the Senate conferred National Environmental Protection Act in 1997.

3.1 Policy Guidelines

The National Conservation Strategy (NCS) is the primary document addressing environmental issues of the country. NCS is duly recognized as the National Environmental Action Plan by various international donor agencies including the World Bank. The document identifies 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural environment. One of these areas is biodiversity conservation. Others include the restoration of rangelands, pollution prevention and abatement, and preservation of cultural heritage.

The Pakistan Environmental Protection Act, 1997 is the key legislation empowering the government to frame regulations for the protection of the environment. Detailed rules, regulations and guidelines required to enforce the Environmental Protection Act are still in various stages of development. Pakistan is a signatory to the Convention on Biological Diversity and is thereby obligated to develop a national strategy for the conservation of biodiversity. A Biodiversity Working group has been constituted under the Ministry of Environment, Local Government and Rural Development to develop a Biodiversity

Action Plan for the country. The Biodiversity Action Plan has been developed after an extensive consultative process and compliments the NCS and the proposed provincial conservation strategies. It identifies the causes of biodiversity loss in Pakistan and suggests a series of proposals for action to conserve in the country. The Pakistan Environmental Protection Council (PEPC) has approved the plan and while the provincial steering committees are in the process of being formed, a federal steering committee is already in place.

3.2 Environmental Institutions and Administration

The Constitution of Pakistan distributes the legislative powers between the federal and the provincial governments through "Federal and Concurrent Lists" attached to the Constitution as appendices. The Federal list depicts the areas and subjects on which the Federal government has exclusive powers. The second, concurrent list contains areas and subjects on which both Federal and Provincial governments can enact laws. The Ministry of Climate Change is responsible for environmental issues at federal level. The NCS unit within the Ministry ensures implementation of the National Conservation Strategy.

The Pakistan Environmental Protection Agency (PEPA) at the federal level is responsible for administering the provisions of the Environmental Protection Act. It is responsible to ensure compliance with the National Environmental Quality Standards (NEQS), develop monitoring and evaluation systems and initiate legislation when necessary. The Provincial Environmental Protection Agencies (Environmental Protection Directorate in Khyber Pakhtunkhwa) are responsible for environmental planning and development, approval of Initial Environmental Examination (IEE) and Environmental Impact Assessments (EIA) of new projects at provincial level. Wildlife conservation and management is also a provincial subject. Provincial Wildlife and forestry departments are responsible for implementation of provisions of provincial Wildlife Protection Ordinances, Acts and Regulations.

3.3 Laws, Regulations and Guidelines

3.3.1 Pakistan Environmental Protection Ordinance, (PEPO) 1983

The Pakistan Environmental Protection Ordinance (PEPO) 1983 was the first piece of legislation specifically established to tackle the issue of environment. This Ordinance provided for the establishment of a Council to frame policies on standards for the environment, and the establishment of an agency to implement the policies and enforce the standards.

As a result the Federal Government of Pakistan established the Pakistan Environmental Protection Council and the Pakistan Federal Environmental Protection Agency (FEPA). The Ordinance permitted FEPA to delegate powers to any Government agency and it is understood that under this power the NWFP, EPA and Punjab EPA were set-up in 1989. One particular task of the FEPA was to set National Policy and Standards. Under the provisions of PEPO 1983, the FEPA established the National Environmental Quality Standards (NEQS) that were gazette as Statutory Notification in 1993. These standards are applicable to all development projects through all phases of pre-construction, construction and operation. NEQS have been issued for liquid effluents and for industrial gaseous emissions and also for municipal effluents, motor vehicle exhausts and noise emissions. Pakistan Environmental Protection Act was introduced in December 1997 to provide for protection, conservation, rehabilitation and improvement of the environment, for prevention and control of pollution and for sustainability of all development activities. The Act includes the following additional clauses that are pertinent to establishment of Proposed Project:

- ❑ S.R.O. 339 (1)/2001 – In exercise of the powers referred in Section 33 of the PEPA 1997 (XXXIV of 1997), Pak – EPA has, with the approval of the Federal Government introduced “Pak-EPA (Review of IEE and EIA) Regulations, 2000.
- ❑ Clause 14 – “Handling of Hazardous Waste” requires anyone who generates, collects, consigns, transports, treats, disposes of stores, handles or impacts any hazardous waste has to have a permit to do so from FEPA.
- ❑ Clause 16 – “Environmental Protection Order” permits FEPA to enforce protection measures and remediation where contamination of the environment has taken place. Where an order is not carried out, FEPA has the authority to carry out the required works and to recover the costs from the person responsible for the source of environmental contamination.

- ☐ Clause 18 – “Offences by Bodies Corporate” identifies individual responsibility and liability to prosecution where contravention of an Ordinance is committed by a body corporate.
- ☐ Clause 30 – “Ordinance to over-ride other laws”, takes precedence over other laws in effect at the time.

3.3.2 The Punjab Environmental Protection Act, 1997 (Amended 2012)

12. Initial Environmental Examination and Environmental Impact Assessment

(1) No proponent of a project shall commence construction or operation unless he has filed with the Provincial Agency] an initial environmental examination or, where the project is likely to cause an adverse environmental effect, an environmental impact assessment, and has obtained from the [Provincial Agency] approval in respect thereof.

(2) The [Provincial Agency] shall— (a) review the initial environmental examination and accord its approval, or require submission of an environmental impact assessment by the proponent; or (b) review the environmental impact assessment and accord its approval subject to such conditions as it may deem fit to impose, or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated, or reject the project as being contrary to environmental objectives.

(3) Every review of an environmental impact assessment shall be carried out with public participation and no information will be disclosed during the course of such public participation which relates to—(i) trade, manufacturing or business activities, processes or techniques of a proprietary nature, or financial, commercial, scientific or technical matters which the proponent has requested should remain confidential, unless for reasons to be recorded in writing, the Director-General of the [Provincial Agency] is of the opinion that the request for confidentiality is not well-founded or the public interest in the disclosure outweighs the possible prejudice to the competitive position of the project or its proponent; or (ii) international relations, [Punjab] security or maintenance of law and order, except with the consent of the [Government]; or (iii) matters covered by legal professional privilege.

(4) The [Provincial Agency] shall communicate its approval or otherwise within a period of four months from the date the initial environmental examination or environmental

impact assessment is filed complete in all respects in accordance with the prescribed procedure, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations made thereunder.

(5) Subject to sub-section (4) the [Government] may in a particular case extend the aforementioned period of four months if the nature of the project so warrants.

(6) The provisions of sub-sections (1), (2), (3), (4) and (5) shall apply to such categories of projects and in such manner as may be prescribed.

(7) The [Provincial Agency] shall maintain separate Registers for initial environmental examination and environmental impact assessment project, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open to inspection by the public at all reasonable hours and the disclosure of information in such Registers shall be subject to the restrictions specified in sub-section (3).

3.3.3 Pakistan Environmental Protection Agency Review of IEE and EIA Regulation, 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 and EIA is one of the main components of the Regulations. Projects have been classified on the basis of expected degree of adverse environmental impacts. Project types listed in Schedule-II are designated as potentially less adverse effects. Schedule-I projects require an IEE to be conducted, rather than a full-fledged EIA, provided they are not located in environmentally sensitive areas. 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 submittal is to be accompanied by an application in prescribed format included as Schedule-IV of the Regulations.
- ❑ 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 of receipt of request and complete documentation.
- ❑ The IEE/ EIA approval will be valid for three years from date of accord.

The regulations of monitoring report are required to be submitted to the EPA after the completion of construction followed by annual monitoring reports during operations.

3.3.4 National Environmental Quality Standards (NEQS)

The National Environmental Quality Standards (NEQS) developed under the Pakistan Environmental Protection Act 1997 establishes the following discharge concentration

standards:

- ☐ Maximum allowable concentration of the Pollutants, (32 parameters) in emission and liquid industrial effluents discharged to inland waters, sewerage treatment and the sea
- ☐ Maximum allowable concentration of pollutants (16 parameters) in gaseous emission
- ☐ Maximum allowable exhaust emissions and noise emission from vehicles.
- ☐ Maximum allowable noise level from vehicles
- ☐ Maximum allowable limits for Drinking Water
- ☐ Maximum allowable limits for Ambient Air Quality

3.3.5 National Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules, 2001

Under these rules, industrial units are responsible for self-monitoring and reporting environmental monitoring data to Federal EPA. Some of the pertinent sections of these rules are reproduced as below:

Para (3): "Responsibility for reporting. - All industrial units shall be responsible for correct and timely submission of Environmental Monitoring Reports to the Federal Agency".

Para (4): "Classification of industrial units. - On the basis of the pollution level of an industrial unit, the Director-General shall classify the unit into category "A", "B" or "C" for liquid effluents, and category "A" or "B" for gaseous emissions:

Provided that till such time as the pollution level of an industrial unit is determined, it shall be classified according to the type of industry to which it belongs, as shown in Schedule I for liquid effluents and in Schedule II for gaseous emissions".

Para (5): "Category-A industrial units. -

1. An industrial unit in category "A" shall submit Environmental Monitoring Reports on monthly basis-

(a) In respect of liquid effluents, for priority parameters listed in column 3 of Table A of Schedule III:

Provided that during start-up or upset conditions, priority parameters mentioned in column 4 of Table-A of Schedule III shall be recorded on hourly basis;

(b) In respect of gaseous emissions, for priority parameters listed in Table B of Schedule III.

2. An industrial unit in category "A" shall maintain a record of the times during which start-up and upset conditions occur, and shall mention the total time elapsed in such conditions in its monthly "Environmental Monitoring Report".

Para (6): "Category-B industrial units- An industrial unit in category "B" shall submit Environmental Monitoring Reports on quarterly basis-

- (a) In respect of liquid effluents, for priority parameters listed in Table A of Schedule IV;
- (b) In respect of gaseous emissions, for priority parameters listed in Table B of Schedule IV".

Para (7): "Category "C" industrial units. - An industrial unit in category "C" shall submit Environmental Monitoring Reports on biannual basis for priority parameters in respect of liquid effluents listed in Schedule V".

Para (8): "Monitoring conditions of EIA approval. - The provisions of these rules shall be in addition to, and not in derogation of, the monitoring conditions laid down in an EIA approval".

3.3.6 Safety Regulations

- ☐ Following laws and regulations directly or indirectly govern the occupational health and safety issues during the currently studied production activities:
- ☐ Factories Act, 1934
- ☐ PEPA Laws, 2000
- ☐ Labor Laws
- ☐ Electricity Rules, 1937
- ☐ Nuclear Safety & Radiation Act, 1990.

3.3.7 Other Regulations

- ☐ The Forest Act, 1927
- ☐ Rules for Prohibition and Regulation of Fishing Burboster, Labeo Rohita, Catlacatla, Cirrhina, and Mirgala less than 10 inches in length. (No. 2989/54-6541-D (f), 1954
- ☐ West Pakistan Land Reform Rules, 1959
- ☐ West Pakistan Land Reforms Regulation, 1959, MLR No. 64
- ☐ West Pakistan Wildlife Protection Ordinance, 1959
- ☐ Wildlife Protection Rules, 1960
- ☐ The Land Acquisition Act, 1984
- ☐ Wild Birds and Animals Protection Act, 1992

3.4 Environmental Guidelines of the Pakistan EPA

Sets of environmental guidelines to facilitate environmental assessment studies have been developed under the statutory cover of the Pakistan Environmental Protection Act, 1997. The following guidelines have been developed through a consultative process:

- ☐ Guidelines for the preparation and review of environmental reports
- ☐ Guidelines for Public Consultations
- ☐ Guidelines for sensitive and critical areas
- ☐ Sectoral Guidelines

3.5 Environmental Guidelines of UNEP and the World Bank

Some of the environmental guidelines of UNEP and the World Bank are as follows:

- ☐ Environmental Impact Assessment Training Resource Manual, Draft 1996, UNEP
- ☐ Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production (WB/UNIDO/UNEP, 1999)
- ☐ Environmental Assessment Sourcebook, Volume-I: Policies, Procedures and Cross-Sectoral Issues (WB, 1991a)
- ☐ Environmental Assessment of Energy and Industry Projects (WB, 1991a)

3.6 International Treaties and Obligations

Pakistan is a signatory to various international treaties and conventions on the conservation of the environment and wildlife protection. Some of these treaties and conventions are as follows:

- ☐ UN Convention on Biological Diversity, Rio-de-Janeiro (1992)
- ☐ Convention of the Conservation of Migratory Species of Wildlife Animals (1979)
- ☐ International Plant Protection Convention (1952)

3.7 Environmental Assessment Process

The environmental assessment process is governed by the following documents:

- ☐ The Pakistan Environmental Protection Act, 1997
- ☐ Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000.
- ☐ Pakistan Environmental Protection Agency Guidelines for the preparation and review of environmental reports.

Submission of environmental assessment study report to obtain No-Objection-Certificate (NOC) was made mandatory by the Pakistan Environmental Protection ordinance (1983) and the Pakistan Environmental Protection Act (1997). Section 12(1) of the Pakistan Environmental Protection Act (1997) stipulates that no project involving construction or any change in the physical environment can be undertaken unless an IEE or an EIA is

conducted, and approval (NOC) is received from the relevant provincial Environmental Protection Agency.

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulation (2000) categorize projects into various schedules based on the anticipated environmental hazards. Projects with fewer environmental hazards are listed in Schedule-I and are required to carry out an Initial Environmental Examination (IEE). Projects with significant environmental hazards are grouped as Schedule-II. Projects listed in Schedule-II require that a detailed Environmental Impact Assessment (EIA) is carried out. Projects listed under Schedule-I will require a detailed EIA if the project is to be located in a sensitive area.

3.8 Cutting of Trees Act, 1992

The Cutting of Trees Act mandates that no person shall, without prior written approval from authorized officer shall cut, fell or damage trees growing in:

- ☐ First Zone (Area adjacent to and beyond the external frontier of Pakistan to a line at four kilometers measured from the external frontiers of Pakistan) if the number of remaining trees in any field falls short of the number to be calculated at the rate of fifteen trees per acre.
- ☐ Second Zone (Area adjacent to and beyond the first zone extending towards Pakistan to a line of four kilometers measured from the first zone) if the number of remaining trees in any field falls short of the number to be calculated at the rate off ten trees per acre.

3.9 Legal Requirement

Pakistan Environment Protection Agency (Review of IEE & EIA) Regulation 2000, Schedule-I clearly states the list of those project that requires IEE. The proposed project of the installation of 36 MW bagasse fired cogeneration power plant of RYK Energy Limited falls under Schedule-I (IEE).

Chapter - 4

PROJECT DESCRIPTION

Chapter - 4

PROJECT DESCRIPTION

The proposed project is described below, with particular emphasis on aspects related to the environment.

4.1 Type and Category of Proposed Project

Pakistan Environment Protection Agency (Review of IEE & EIA) Regulation 2000, Schedule-I clearly states the list of project requiring IEE. The proposed project of the installation of 36 MW bagasse fired cogeneration power plant of RYK Energy Limited falls under Schedule-I (IEE).

4.2 Project Objectives

The objectives of the proposed project are as follows:

- To generate cleaner, economical and reliable energy from indigenous biomass fuel
- To boost agriculture sector of Pakistan
- To save millions of dollars which are wasted to import expensive oil to be used as fuel for producing electricity
- To maintain long-term viability of sugar sector
- To reduce environmental hazards caused by burning furnace oil as fuel for producing electricity.

4.3 Project Details

RYK Energy Limited, a public (unlisted) company, owns and operates 13,000 TCD sugar mill with 30 MW power house. The mill is located at Janpur, district Rahim Yar Khan. The company is currently in the process of setting up a 67 Bar High pressure bagasse based co-generation power project having 36 MW gross capacities under the Policy Framework for Power Cogeneration 2013 for Bagasse / Biomass to include bagasse / biomass under the ambit of the Renewable Energy Policy, 2006. The

proposed project spill over capacity will be 19MW. The project will be situated adjacent to the company's sugar mill.

The Project shall utilize the company's self-generated bagasse as the sole fuel. Bagasse shall be fired in high pressure boiler to produce steam to generate electricity. Figure 4.1 shows basic outline of the proposed project of RYK Energy i-e 36 MW bagasse fired cogeneration power plant.

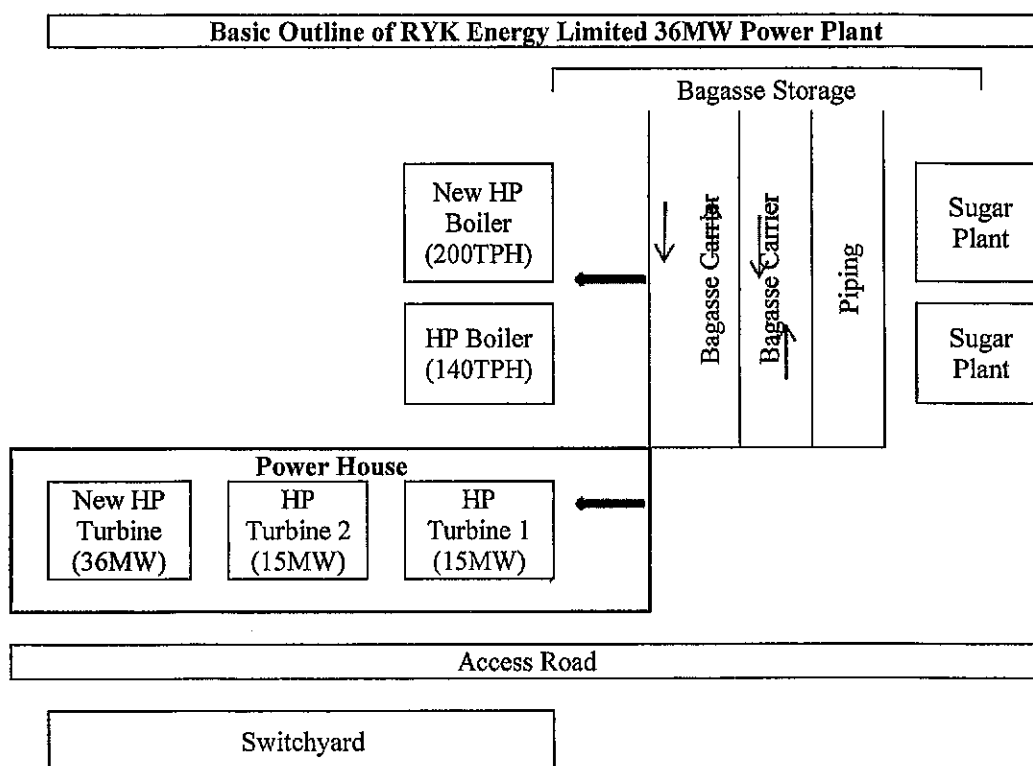


Figure 4.1: Basic Process flow diagram of RYK Energy Limited 36MW Power Plant

4.4 Identification of Site Area

The proposed project site for the installation of bagasse fired cogeneration power plant is mainly surrounded by the agricultural land. Other areas include:

East Side	Malik Murad
West Side	Basti Parara
North Side	Motha Brodery
South Side	Basti Parrva (Padva)

4.5 Development of Site Area

Before the commencement, the selected site will be developed according to the requirements of the construction plan. This will include the following activities:

- No evacuation will be required as there is no settlement and people have already moved out of the site. So, no resettlement issues.
- A reasonable length of access path will be developed or constructed
- Clearing of vegetation and land may not be needed, as the site has very less number of trees or shrubs. Plantation after the construction for esthetically sound environment will be practiced.
- Construction of a water storage pit lined with a suitable liner.
- Construction of drains around the proposed site to collect liquid discharges and storm waters and transfer into the discharge pit/tank.
- Construction of a garbage pit for suitable waste disposal as per standard operating procedure of the industry.
- Construction of system of septic tanks for the disposal of domestic and sanitary effluents.

4.5.1 Land Use

The land where the proposed project would be constructed is surrounded by the agricultural land, but itself is not the agricultural land, and is mostly barren with few trees and shrubs. As the plantation does not belong to any kind of endangered species of flora, so they would be cleared. But to add to the scenic beauty and to restore the project site area, a proper restoration and rehabilitation plan would be implemented. The restoration and rehabilitation plan designed for RYK Energy has been attached as **Annex O** of this report.

4.5.2 Road Access

The project location in the map has been attached in Annex N of this report shows the main road accesses to the industry and the proposed facility. The Grand Trunk Road naming N-5 is the main road access link for the industry. Whereas, the Liaquatpur road

(as shown in the map) is an alternative route for the industry which joins N-5 (the main road).

4.5.3 Vegetation features

The flora of the area characterizes two major ecological divisions, Northern and Southern. The botanical life found in the northern half identifies itself with that of the rest of the irrigated tracts at central Punjab. The human interference in the form of irrigation network has virtually wiped out the old plantation without much revolutionization of the phytophysiology in the area. While there had been a considerable increase in the cultivated area. Factors such as water logging and salinity have badly hit plant life and with the increase of salinity at the surface, only the salt resistant plants can survive in most of the area. The southern half is characterized by sand dunes. More or less barren of vegetation except in the rainy season when multitudes of ephemeral or short lived plants come up and transform the bare land into a lush green carpet. For more information the details of flora and fauna of the city district has been attached as **Annex L** of this report.

4.5.4 Cost & Magnitude

The total cost of the project is in US dollars is around or about 35.262 Million Dollars. The project was categorized on the basis of the power generation capacity of the proposed project and is less than 50MW, so the project requires IEE to gain environmental approval from the concerned EPA.

4.5.6 Schedule of Implementation

As the power generation capacity of the proposed project is about 36MW, the project requires IEE report for its environmental approval. As the project is waiting for the environmental approval from the EPA, as soon as it gets the No Objection Certificate for construction, the construction of the project would start instantly and would complete in the period of about 12-14 months. This schedule of implementation has been devised regarding the time taken by EPA to issue the environmental approval. Furthermore, this schedule has been designed by taking into consideration the ideal conditions for the construction and operation, any unforeseen natural or manmade circumstances may cause delays in the implementation.

4.5.7 Development of Water Supply System

Water will be required for construction and operations as well as for drinking purposes. Drinking water is obtained from RO Plant depth 100 feet; moreover ground water quality is good for drinking purpose.

4.5.8 Power Generation

Power requirement for the proposed project will be fulfilled by the power generation plant.

4.6 Project Components

The proposed project includes the following essential components:

Pre Construction Phase

- Removal of demolition material, leveling of ground surface.
- Borehole for ground water abstraction.
- Selection of the place for the site office.

Construction Phase

- Excavation and diggings for construction and placing of foundations.
- External Development, Land scaping, pavement, Parking, Beautification and Ornamentation.
- Provision of utilities and services structure, construction of generator room and workshops.
- Construction of sewerage system, wastewater collection and disposal network.
- Measures to reduce dust and vibration will be the responsibility of the Contractor. These will include the use of dust control agents such as water and the paving of roads subject to heavy traffic.
- A monitoring program for soil, surface and groundwater quality; and discussion of contingency measures will be included.

- Adequate personal protective equipments shall be provided to the construction workers to ensure their safety and the applicant shall ensure its usage by the labours.

Any negative impacts expected to occur during construction are no more severe than what would be expected from any construction project. Companies shortlisted for construction of the project will be required to submit evidence that the following management systems are in operation in their day to day construction activities: Quality Management System, Environmental Management System, and Health and Safety Management System. Contract documents will require a site specific Environmental Management Plan to be developed and submitted for approval prior to commencement of construction.

Post Construction Phase (Operational Phase)

The post construction phase of the projects is usually the operational phase of the project as well. In this section, it is assumed that the construction of the proposed power plant has been concluded, and now it's time to fully operate the said project, and to check, whether it is complying with its own objectives and meeting the environmental standards or not. For this purpose, following are some of the measures which will be necessarily adopted:

- Clearing of the area which was previously inhabited by the construction workers and machinery.
- Cleaning of the construction debris and restoration of the project site previously excavated for the construction operation
- Maintenance of essential services and supplies.
- Environmental management including waste collection and disposal, janitorial services, horticulture and beautification.
- Periodic as well as annual repair and maintenance of civil structures, machinery and equipment.
- Regular environmental monitoring of the power plant to see whether it is complying with the environmental standards or not.
- The monitoring schedule would be devised by RYK Energy, and would be carried out either through any third party or by EPA certified laboratories.

- The fly ash from the power plant would be an effective replacement in the building material. An effective cyclone would be installed in the chimneys of the plant to catch the fly ash. The collected fly ash would then be collected and would either be landfilled or would be used in the construction material like cheap bricks and mixing material for the concrete.
- Regular monitoring of the fly and bottom ash would be carried out through EPA certified laboratories or by any third party.

4.7 PROJECT ALTERNATIVE:

As the power crisis in Pakistan has become the immense problem for all the industries working within the grounds of the country, hence it has become important for all the stakeholders to move towards the alternative resources of power to continue their business in Pakistan and add to the national income of the country. The proposed project is adjacent to the sugar mill; the land is not inhabited with any kind of human population, so the need of the resettlement action plan has been ruled out as no new land has been brought by anyone. Considering the present energy crisis and the unemployment rate of Pakistan, the project has gained immense importance to combat the energy demand of the sugar mill and to continue providing best products within the country. Hence, no project alternatives were there to be considered in this regard.

4.8 Restoration and Rehabilitation Plans

The site restoration and rehabilitation plan has been attached as **Annex O** of this report.

4.9 Government Approval

The power generation license for the proposed project obtained by RYK Energy has been attached as **Annex P** of this report.

Chapter - 5

DESCRIPTION OF ENVIRONMENT

Chapter - 5

DESCRIPTION OF ENVIRONMENT

5.0 Existing Environmental Resources

RYK Energy Limited plans to install 36 MW Bagasse Cogeneration Power Plant at Rukan Abad, Janpur, Tehsil Liaqatpur, District, Rahim Yar Khan. The total area for proposed project site is 10 acres. The major locations around the project site are Malik Murad on east, Basti Parara on west, Motha Brodery on north, Basti Parrva (Padva) on south.

Rahim Yar Khan is one of the modern district headquarter cities in Punjab. Although the city seems a far off place to those living in Lahore, Karachi or Islamabad, the city has very good civic facilities. It is connected with the rest of the country through rail and air including the other industrial hubs such as Lahore, Karachi, Quetta and Faisalabad. Industries include fertilizer, cosmetics, glass manufacturing, cotton production and processing, large textile units, flour mills, sugar and oil mills and large-scale power generation projects. Cotton production in Punjab Province starts from this area. Mango and Malta are two main fruits of this city. Cottage industries include ginning, pottery/clay products, agricultural machinery, handicrafts, and embroidery.

District Rahim Yar Khan has a very hot and dry climate in summer. The maximum temperature touches 49.7 °C. The minimum temperature recorded is 6.8 °C. The average annual rainfall in the district is 165 mm. The district can be divided into three main parts i.e. the riverain area, the canal irrigated area and the Cholistan area. The riverain area of the district lies close to the river Indus and Panjnad. To the South West of this area lies the canal irrigated area. The land in this area is higher than that of the riverain area. The approximate height of this area is 150 to 200 meters above sea level. The desert area lies in the South-East of the district. It is called Cholistan. It

extends into Bahawalpur and Bahawalnagar districts, occupying the South-Eastern part of the two districts. The surface of the desert consist of a succession of sand dunes rising in places to a height of about 150 meters and covered with the vegetation peculiar to sandy tracts.

Data used to compile this section was obtained from two main sources: published literature and field survey. Published Literature was reviewed to collect available environmental information on the Rahim Yar Khan including climate, ecological, biological, socioeconomic, cultural conditions and land use. Field survey was also conducted to collect primary data for this study. A team consisting of an environmentalist, a sociologist and a biologist visited the project area. In order to evaluate the current status of the area, the team studied ecological, biological, economic and cultural characteristics.

5.1 Geomorphology and Geology

Pakistan can be divided into five broad physiographical regions. These are the mountainous regions of the north, the western highlands and plateaus, the sub-mountainous Indus region, the Potohar Plateau, Salt Range, and the Indus Plain.

Brief descriptions of these regions are presented in **Exhibit 5.1**.

Exhibit 5.1: Physiographical Regions of Pakistan

<i>Region</i>	<i>Characteristics</i>	<i>Location</i>	<i>Height</i>
Northern Mountainous	Hindu Kush, Karakoram and Himalayan Mountain Range	Northern part of KPK, Gilgit Agency, Northern areas & Kashmir	Rises above 8000-m
Western Highlands & Plateaus	Toba Kakar, Sulaiman Central Baruhi, Saihan Central Makran Coastal & Kirthar Ranges	Mainly in Baluchistan, also parts of Sindh and KPK	Between 1,200 to 3,000-m
Sub-Mountain Indus	Alluvium filled Basins	Plains of Peshawar, Kohat and Bannu	Less than 1,000-m
Potowar Plateau and Salt Range	Flat to gently undulating surface, broken by gullies, accelerated erosion "bad land" topography	Mainly northern parts of Punjab, some parts of KPK	Less than 1,000-m
Indus Plain	Flood plains of the Indus, Jhelum, Chenab, Ravi and Sutlej Rivers	Punjab and Sindh	Less than 1,000-m

5.2 Water Resources

The area has sufficient but uncertain rainfall.

5.3 Drainage Feature

The water supply and sewerage facilities have not been developed according to increase in population due to constraint of resources. As such the gap between supply and demand has been widened. Present sewerage coverage of the district is 55%.

5.4 Climate

District Rahim Yar Khan has a very hot and dry climate in summer. The maximum temperature touches 49.7°C. The minimum temperature recorded is 6.8°C. The average annual rainfall in the district is 165 mm. The district can be divided into three main parts. These are the riverain area, the canal irrigated area and the Cholistan area.

The riverain area of the district lies close to the river Indus and Panjnad. To the South West of this area lies the canal irrigated area. The land in this area is higher than that of the riverain area. The approximate height of this area is 150 to 200 meters above sea level. The desert area lies in the South-East of the district. It is called Cholistan. It extends into Bahawalpur and Bahawalnagar districts, occupying the South-Eastern part of the two districts. The surface of the desert consists of a succession of sand dunes rising in places to a height of about 150 meters and covered with the vegetation peculiar to sandy tracts.

5.4.1 Description of Seasons

- Winter (October to February) are moderate to extreme and dry
- Spring (March to April) is pleasant with moderate cold
- Summer (May to September) is very hot to humid
- Monsoons (June to August) are wet. Although the temperatures are milder but due to high humidity the heat is oppressive

5.4.2 Temperature

The temperature data was obtained from Meteorological department. Temperature data for this region is shown below in Table 5.1 & 5.2.

Table 5.1: Annual Temperature Mean (Max) (°C)

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	23.0	26.1	33.2	40.9	44.3	45.9	42.2	40.0	38.8	37.3	29.5	25.5
2006	21.4	26.2	33.6	40.5	43.0	42.1	40.1	41.5	37.7	34.8	29.1	25.7
2007	21.2	26.4	29.0	40.2	41.3	40.9	41.6	40.9	36.8	35.6	28.8	24.8
2008	22.2	27.2	31.4	40.4	40.2	40.8	40.1	41.1	35.6	35.8	29.1	24.1
2009	22.6	27.5	30.7	40.3	42.2	43.5	41.9	40.8	39.7	36.8	30.4	25.1

Table 5.2: Annual Temperature Mean (Min) (°C)

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	3.14	4.12	10.4	15.2	20.3	25.5	22.7	24.3	18.8	13.9	12.3	6.3
2006	4.4	8.8	11.7	18.0	22.7	25.8	24.3	26.2	24.9	15.6	12.0	6.6
2007	5.3	10.4	12.4	19.1	24.5	25.8	25.1	27.9	26.6	16.2	12.9	6.1
2008	7.8	10.2	13.7	19.7	25.3	25.6	26.6	27.5	25.0	17.2	13.4	6.8
2009	9.5	11.5	14.8	20.5	26.8	25.5	27.5	28.1	25.4	17.9	13.8	9.8

5.4.3 Rainfall and Hydrology

Precipitation is in the form of rainfall. Towards the end of June, monsoon conditions appear and during July- August and part of September, rainy season alternates with intervals of Sultry weather. Most of the rainfall falls during July-September. Some winter cyclonic rains are received during February and March. This pattern of rainfall will support xerophytes vegetation and all introduced flora shall largely depends upon year round irrigation.

Groundwater is the subsurface water that resides in the zone of saturation. In the zone of saturation, the voids (pores) between the soil particles are filled with water. The water table is the upper boundary of this zone of saturation. The water table is also defined as the surface at which the fluid pressure in the pores is equal to the atmosphere pressure. Above the water table is the zone of the aeration, or unsaturated zone. The water table surface in a humid climate tends to follow the topography of the land surface, provided that the aquifer is unconfined. A sloping water table implies that ground water is flowing from a point of higher elevation to one of the lower elevation. The water table intersects the land surface where there is surface water. When an overlaying impermeable layer confines the aquifer, the water will be under pressure and will rise in a well that is cased to the aquifer.

Table 5.3: Monthly Total Rain (Mm)

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	0.04	0.10	0.07	0.02	0.9	0.34	2.03	2.18	0.32	0.01	0.00	0.00
2006	8.7	0.12	0.14	1.2	1.6	1.9	1.6	2.25	1.9	4.6	3.6	15.2
2007	9.0	0.48	7.8	1.5	1.1	4.9	2.7	2.58	0.0	0.0	0.0	17.9
2008	12.6	0.55	8.0	1.8	1.9	5.7	2.1	1.15	5.8	5.0	0.0	25.9
2009	14.2	0.88	8.8	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0

5.4.4 Relative Humidity

Relative humidity in the project area varies between 49 % to 72% during August. The higher humidity during summer due to higher rates of evapo-transpiration, as the monsoon rain, irrigation and Kharif cropping pattern favor its rise. Presently the indigenous as well as exotic flora is fairly adjusted to the hydrological cycle in the area. The relative humidity is given in Table 5.4

Table 5.4: Relative Humidity at 0800 am (%)

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	93	87	82	48	50	48	70	70	71	69	80	81
2006	86	88	76	46	45	50	71	72	70	74	83	84
2007	87	89	82	50	48	55	70	70	73	70	74	83
2008	84	83	73	40	54	57	73	73	79	71	71	80
2009	87	82	75	46	53	49	75	67	82	72	69	78

Table 5.5: Relative Humidity at 0500 pm (%)

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	48	50	47	24	29	29	51	49	50	34	39	38
2006	40	52	41	20	30	27	41	51	44	44	51	50
2007	50	55	43	22	28	35	48	48	46	28	47	44
2008	52	49	45	24	27	32	40	55	47	40	32	59
2009	56	46	49	25	31	30	42	60	42	32	39	38

5.4.5 Wind Direction & Speed

The prevalent wind velocity is 10-25 kmp/h. Sometimes storms occurred at rate of 60 kmp/h. Mostly, the summers are windy. But at times the winter winds can blow above

25 kmp/h and cause extreme cold. The indigenous vegetation, the exotic flora and the fauna is adequately adjusted with the pattern of prevalent wind velocity in the area. The predominant wind directions and velocity are depicted in Table 5.6 to Table 5.9.

Table 5.6: Wind Direction at 0800 am

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	N67E	N17E	N26E	N43W	N04W	S19W	S12E	S03E	S49E	S38E	N15W	N15E
2006	N	N	N32E	N13W	S20E	S13E	S32E	S66E	S24E	S32E	N30E	N17W
2007	S74E	N11W	N	S32W	N79E	S10E	N27E	N33E	S85E	S45E	N45W	N
2008	N36W	N37W	N25W	N34W	S31E	S15E	S30E	S23E	S16E	S74E	N09W	N15W
2009	N	N17W	N	N06E	N19E	S07E	S26E	S09W	S10E	N	N45E	N45W

Table 5.7: Wind Direction at 0500 pm

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	N01E	S10W	N48E	S51W	W	S38W	S29E	S05E	S56E	S16E	N22E	N
2006	N55E	N80E	S74E	S01W	S10W	S36E	S47E	S64E	S64E	S19E	N11E	N05E
2007	N63E	N34E	S46E	S11W	S54W	S22W	S05E	S47E	S39E	S47E	S67W	N67W
2008	N37E	N28E	S62E	S36E	S22E	S06W	S33E	S13E	S44E	S54E	S51E	N30W
2009	N17E	S49E	S85E	S38W	S52W	S39W	S41E	S05E	S12E	S	C	C

Table 5.8: Wind Speed (Knots) at 0800 am

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	0.3	3.2	2.3	2.7	4.3	7.1	5.5	9.2	5.0	1.2	0.6	0.4
2006	0.7	1.1	3.0	3.6	4.3	50	6.3	4.1	3.7	1.9	1.0	0.7
2007	0.4	1.4	2.0	2.5	4.1	6.5	5.9	5.4	3.3	0.5	0.9	0.2
2008	1.0	1.1	0.8	3.5	4.3	6.9	6.0	4.7	3.5	1.0	0.5	0.5
2009	0.6	0.9	1.5	2.5	3.0	4.2	5.7	7.2	2.8	0.8	0.1	0.2

Table 5.9: Wind Speed (Knots) at 0500 pm

Years	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2005	3.4	3.5	4.8	5.8	3.7	6.9	4.6	8.6	6.3	3.4	0.6	0.9

2006	1.3	3.8	6.2	4.3	5.3	6.5	6.7	5.9	5.5	4.1	2.1	1.5
2007	1.3	2.5	3.5	4.3	5.1	6.7	7.2	6.7	4.1	2.1	0.5	0.6
2008	1.9	4.3	4.2	4.1	5.3	6.7	6.8	5.9	4.5	1.9	0.9	0.9
2009	1.9	2.9	4.1	4.1	4.0	7.0	2.8	8.6	4.3	0.6	0.0	0.0

5.5 Water Quality

The water is available from following sources:

- Rain water for agriculture and surface storage
- Surface water i.e. ponds and canals and
- Ground water i.e. wells and tube wells

The area is not deficient in water supply. The RO is also installed at the proposed project site.

5.5.1 Potable Water Quality

Ground water sample was collected and analyzed for the monitoring of water quality near the proposed site of RYK Energy Limited.

Analysis of total 14 parameters were carried out, the overall water quality of sample GW-1 is satisfactory. This water can be used for drinking purpose.

Table 5.10: Summary of Parameters for Ground Water Quality

Sr. No	Parameters	Units	WHO Guide lines	GW-1
1	pH Value	6.5-8.5	7.48
2	Arsenic	mg/l	0.01	BDL
3	Chloride	mg/l	250.0	74.0
4	Fluoride	mg/l	1.5	0.25
5	Sulphate	mg/l	250.0	41.0
6	Sulphide	mg/l	--	BDL
7	Sodium	mg/l	200.0	116.5
8	Potassium	mg/l	--	5.4
9	TSS	mg/l	--	0.0
10	TDS	mg/l	1000.0	410
11	Chromium Total	mg/l	0.05	BDL
12	Lead	mg/l	0.05	BDL
13	Iron	mg/l	0.3	0.02
14	Nitrate	mg/l	50.0	2.1

5.6 Soil Quality

Soil sample was taken from the proposed project site which is influenced by the geological nature of the area. The overall results of the soil show no contamination from any existing facility.

Table 5.11: Summary of Parameters for Soil Quality

Sr. No.	Parameters	Unit	S-1
1	Sulphate	mg/kg	182
2	Sulphide	mg/kg	0.6
3	Fluoride	mg/kg	BDL
4	pH	8.1
5	Chloride	mg/kg	126
6	Sodium	mg/kg	248
7	Potassium	mg/kg	24
8	Calcium	mg/kg	172.0
9	Magnesium	mg/kg	28
10	Barium	mg/kg	BDL
11	Iron	mg/kg	1.3
12	Zinc	mg/kg	8.3

5.7 Ambient Air Quality

Ambient Air Quality affects everyone everywhere. Whether it is agricultural dust, pollution from vehicles, or smog from major industry, ambient air can have major effects on the health of individuals. For ambient air quality analysis, five air samples have been analyzed from the proposed project site from different locations.

ECO/A-1.....Mid of Project Site

ECO/A-2..... Near Workshop

ECO/A-3..... Near Crushing Workshop

ECO/A-4..... Near Existing Cogeneration Plant

ECO/A-5..... Outside Gate

**Table 5.12: Summary of Ambient Air Quality Analysis of Proposed Bagasse
Power Plant Project Site of RYK Energy Limited**

Sr. No.	Sources	CO	SO ₂	NO ₂	CO ₂	PM ₁₀
	Units	<i>ppm</i>	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	<i>ppm</i>	$\mu\text{g}/\text{m}^3$
	NEQS	9	120	80	-	150
1	ECO/A-1	BDL	20.8	6	451	76
2	ECO/A-2	BDL	23.4	22	431	79
3	ECO/A-3	BDL	52.0	27	456	71
4	ECO/A-4	BDL	39.0	31	431	74
5	ECO/A-5	BDL	80.6	54	404	86

Health effects from air pollutants may be experienced soon after exposure or, possibly, years later. Immediate effects may show up after a single exposure or repeated exposure. These include irritation of the eyes, nose & throat, headaches, dizziness, and fatigue. Such immediate effects are usually short term treatable. Sometimes the treatment is simply eliminating the person's exposure to the source of pollution, if it can be identified. Symptoms of some diseases, including asthma, hypersensitivity pneumonitis and humidified fever, may also show up soon after exposure to air pollutants.

The reactions to air pollutants depend on several factors. Age and preexisting medical conditions are two important influences. In other cases, whether a person reacts to a pollutant depends on individual sensitivity, which varies tremendously from person to person. Some people can be very sensitized to biological pollutants after repeated exposures, and some people can be sensitized to chemical pollutants.

For the ambient air quality various places were selected to record the ambient air data on the spot. Recorded ambient air data is given in the **Table 5.12**. As the table shows that all parameters monitored for ambient air quality were under compliance with NEQS.

5.8 Noise

Noise poses quite different problem. Unwanted sound becomes more pervasive and more intense in urban settings, where transport and industrial sources have particularly high nuisance values. Acute exposure to intense noise may temporarily impair hearing, while repeated occupational exposures to high levels can cause permanent deafness. Increased noise levels are also associated with cardio-vascular, endocrine, respiratory, neurological and psychological changes, some of which are indicative of increased stress.

The unit of measurement of sound is decibel and normal human exposure can vary from minimum that the ear can perceive, i.e., 0 dB to the loudest. For comfortable hearing one needs sound at a level of 55 dB and for relaxed conversation a background of 45 dB or less. Acceptable range for noise level is **75 dB (A)**.

The noise levels recorded at the selected spots of the proposed area were within the acceptable range as shown in **Table 5.13**.

**Table 5.13: Summary of Noise Level Analysis of Proposed Bagasse Power Plant
Project Site of RYK Energy Limited**

Sources	Noise Level dB (A)	NEQS
Mid of Project Site	62.8	75
Near Workshop	61.7	
Near Crushing Workshop	61.9	
Near Existing Cogeneration Plant	63.7	
Outside Gate	65.7	

5.9 Biological Environment

Ecological data is necessary to identify and assess the main effects of the proposed project on environment.

5.9.1 Flora

Plantation, grasses and shrubs along road, rail, canal and river side exist. Similarly, in general, trees, grasses and shrubs exist on the cultivable land. The land is fertile. Major cash crops include sugar cane, cotton, wheat and pulses. Trees, grasses and shrubs found both in the irrigated areas are listed as below:

Trees

Kikar	Acacia Arabia
Phulahi	Acacia Modesta
Siris	Albizia lebbek
Amaltas	Cassia fistula
Lasura	Odia mixa
Shisham tali	Dalbergia sisso
Jaman	Eugenia jambolana
Pipal	Ficus retusa
Barh	Fecus bengalensis
Bakain	Melia azdarach
Toot	Morus alba
Poplar	Populus spp
Date palm	Phoenix dactylifera
Jand	Prosopis spicigera
Mesquite	Prosopis glandulosa
Sukh cahain	Pongamia glabra
White siris	Albizia procera
Nim	Azadirachta indica
Aam	Mangifera indca
Jal or Wan	Salvadora oleodes
Frash	Tamarix articulate
Arjan	Terminalia arjuna

Shrubs

Babri	Acacia jacquemontii
Jawanh	Alhaji-camelorum
Karir	Capparis aphylla
Phog	Calligonum polygonodes
Aak	Alotropis procera
Khar	Haloxilon recurvum
Lani	Salsola fetida
Lana	Suaeda froticora

Grasses

Khabbal	Cynodon dactylon
Khowi	Cymbopogon jwaraucusa
Dhaman	Cenchrus ciliaris
Sinn ghorkhs	Elionurus hirsutus
Dabb	Eragrostic cynosuriodes
Siriala	Hetropogon contortus
Garn mali	Panicum antidotale
Sanwakt	Panicum colnum
Kana	Saccharum munja
Kundar	Typha angusti-folia

5.9.2 Fauna in Wild Life

Mammals

- Buffaloes
- Cows
- Cats
- Dogs
- Rats

Birds

- Sparrow
- Lali
- Crows
- Pigeons
- Red wattled lapwing
- Guinea fowl
- Parrots

Reptiles

- Snakes
- Lizards

Amphibians

- Frogs
- Toads

Insects

- Black ants
- Dragon fly
- Butterfly

It is important to note that there are a number of factors which can change the findings of a survey. These include seasonal variations like temperature variation, humidity in the atmosphere etc. Also the patterns of small migrations of different birds vary from bird to bird and season to season.

5.10 Socioeconomic Environment and Quality of Life

This section provides an overview of the socioeconomic conditions and cultural mores in the project area. The information included here is based on a sample survey of settlement in the area during which interviews were conducted with communities.

5.10.1 General

This section provides an overview of the socioeconomic conditions and cultural mores in the project area. Socioeconomic conditions of the area depend upon the population, employment level, trade and businesses, customs, religion, social activities, occasions, and their social cohesion.

It is to notify that people living in the vicinity mostly belong to a middle class. It was observed that mostly people live in independent family systems, among these families, few like to live in joint family system as the load is distributed among the different earning members of the family. Similarly families who are living in joint family system are of the view that joint family system can create misunderstandings among families and limit the opportunities for progress.

Most of the inhabitants have their own houses and very few of them were living on rent. It was observed through interviews that most of the people have that diseases are more common in rainy season or they are seen more often with the seasonal variations. .

5.10.2 Medical Facilities

The area has many public and private hospitals. Government Hospital is present in Khan Bela. Social Security Hospital and dispensary is present in Rukanabad of Rahim Yar Khan.

The largest private hospital, established by the Saeed family, the Al-Saeed Medical Complex and Surya Saeed Institute of Research and Medical Sciences (SIRMS) is a world leading institute of medical research.

5.10.3 Health, safety and environment

City has very good civic facilities. It is connected with rest of Pakistan by air, rail and road and all types of telecommunication links are available. The city has good educational facilities in public and private sector and Sheikh Zayed Medical College is the latest addition to these. The largest private hospital, established by the Saeed family, the Al-Saeed Medical Complex and Surya Saeed Institute of Research and Medical Sciences (SIRMS) is a world leading institute of medical research.

5.10.4 Administrative Set-up

The proposed project area has a District Coordinating Office (DCO), assisted by a Deputy District Officer (DDO) and Executive District Officers (EDO), the foresaid officers has appointed directly by government.

The entire set up of the local administration in the country has undergone substantial changes under the 'devolution plan'. Under the new system, Administrators' Head the administrative units, such as districts. Each district has a District Coordinating Office (DCO), assisted by a Deputy District Officer (DDO) and several Executive District Officers (EDO). The government has appointed the DCOs, DDOs and EDOs.

5.10.5 Religion

The population of the district is predominantly Muslims i.e. 96.7 percent. The next higher percentage is of Hindu (Jati) with 1.8 percent, followed by Scheduled Castes 0.6 percent. While other minorities like Christians, Ahmadi etc. are very small in number. The proportion of population of Muslims is higher in urban than rural areas. Christians are mostly living in urban areas representing 1.2 percent as compare to 0.2 percent in rural areas. Ahmadis are equal in proportion in urban and rural areas.

5.10.6 Languages

Siraiki is the predominant language being spoken in the district, representing 72.6 percent of the population, followed by Punjabi and Urdu spoken by 17.3 and 2.9 percent respectively and Sindhi by 2.0 percent while others speak Pushto, Balochi, Bravi and Dari etc.

5.10.7 Dress

The common attire in the rural area for the male is a long loose shirt hanging up to the knees, made of coarse cloth, a chadder and pagri. For women in the urban areas, Shalwar and a Dupatta is the dress of choice. In the Cholistan area, the women generally wear short shirts and ghagras and Dopattas. People use cheap and coarse cloth for dresses. For footwear, men in the rural areas wear locally made shoes prepared by the village cobbler (Mochi). The women of this area are very fond of wearing ornaments, both golden and silver.

5.10.8 Industry

The main industries of the district are textile, cotton ginning and pressing, sugar, cottonseed oil, edible oil, soap, beverage making, agricultural implement manufacturing, and fertilizer manufacturing. Cottage industry includes ginning, pottery/clay products, electric desert cooler, agricultural machinery, handicrafts, food industry, and embroidery.

5.10.9 Occupations

Major economic activity in the area is trade and businesses there are people who are working for different industries, departments, government and nongovernmental organizations, agriculture and cultivation.

5.10.10 Education

The literacy ratio in the district has increased from 20.0 percent in 1981 to 33.1 percent in 1998. The literacy ratio for males is 43.4 percent as against 21.8 percent for females. The ratio is much higher in urban when compared with rural areas both for male and female. In 1998, 33.1 percent of the population was reported as being able to read at least one language. This was up from 20 percent in 1981. In urban areas, 65.0 percent of males and 48.4 percent of women were able to read. In rural areas, 37.9 percent of males, and 14.9 percent of females were able to read. There is a Khawaja Freed College, a university campus of Islamic university of BWP, a medical college and a women college.

5.10.11 Agriculture

The main crops of the district are cotton, sugarcane, and wheat, most of the orchards are of mangoes and citrus. The proposed project site for the installation of bagasse fired cogeneration power plant is also surrounded by the agricultural land.

5.10.12 Rural and urban distribution

The urban population was 616,582 or 19.6 percent of the total population of the district which grew at an average rate of 4.3 percent during 1981-98 and had decreased from 4.7 percent observed during 1972-81. There are three Municipal Committees and five Town Committees in the district.

5.10.13 Population

District Rahim Yar Khan has total population of 4,741,053 according to 2009 censuses.

5.10.14 Sites of physical and cultural heritage

There are number of documented or protected sites of archeological, cultural, historical and religious significance in Rahim Yar Khan City. The prime attractions of Rahim Yar Khan are its Baghla Fort, Islam Garh Fort, Khair Garh Fort, Mau Mubarik Fort, Pattan Minar, Bhong Mosque, Palace Sultan of Abu Dhabi etc.

5.10.15 Project Response

The people of the nearby community are strongly in favor of installation of proposed project, earning at any level is more important than any other thing. About 98% of people are in favor of construction of proposed project in their area. Because they are having perspective of healthy future which will bring prosperity to their young ones.

They also gave comments that this project will pave the path of unemployment .As this project will commence; it will open the door of employment opportunities not only during constructional phase but also afterwards.

On the other hand, 2% of people seemed not satisfied with the project. As they said that this project will bring disturbance to them. They were afraid of usage of heavy machinery that will lead to public nuisance i.e., noise pollution and air pollution. They said, if mitigation measures would be provided and monitored then they would have no objection.

So we can deduce from the report that if this project is not harming the natural and green environment, then this project is environment friendly and without any hesitation and deterioration under risk we can commence the project. This will enhance the development of the country and people will get desirable fruitful result.

Chapter - 6

IMPACTS & MITIGATION

Chapter - 6

IMPACTS & MITIGATION

6.0 Background

The potential impacts of the proposed installation on the area's geomorphology, surface and groundwater resources, air quality, biological resources, and socio-cultural environment have been discussed in the following sections. Where appropriate, mitigation measures have also been included to reduce the unacceptable impacts. Likely impacts that trigger the Environmental Management Plan (EMP), and accompanied mitigation measures have been identified in this IEE. The organizational structure and responsibilities of various functionaries towards EMP also have been highlighted, indicated generic environmental control measures that need to be applied during the possible implementation of EMP if and when required.

The purpose of an IEE is not only to address and analyze the expected environmental impacts of a project, but also to enhance project benefits, and to introduce standards of good practice to be adopted for all projects works.

The primary objectives are to:

- Facilitate the implementation of the mitigation measures required by EPA.
- Define the responsibilities of the project proponent and contractor and provide a means of effective communication of environmental issues between them.
- Identify monitoring parameters in order to ensure the effectiveness of the mitigation measures.
- Provide a mechanism for taking timely action in the face of unanticipated environmental situations.
- Identify training requirements at various levels.

6.1 Project Location

Some of the salient points to be kept in view are:

- The proposed project of RYK Energy Limited will be installed at Rukan Abad, Janpur, Tehsil Liaqatpur, District Rahim Yar Khan.

- Ground water is available at the depth of 100 ft. The available water resources are adequate. The area is currently an agriculture land and the existing form of wildlife is restricted to local reptiles and birds.
- The general climatic pattern is characterized by a dry to rainy climate. Summers are quite hot with moderate humidity, whilst winters are of extreme cold.
- RYK Energy Limited keeps Safety Health and Environment as its first priority. The IEE of this project is the commitment to safety, health and environment.

6.2 Key Environmental Problems and their mitigations

The proposed project of installation of Bagasse Power Plant will be accomplished in three main phases; construction, development and operation.

Environmental concerns associated with such activities are as follows:

Physical Environment

- Solid Waste
- Particulate Matter
- Gaseous Emissions
- Noise Level
- Water resources
- Air Quality

Biological Resources

Biodiversity (Flora & Fauna)

Socio-economic Impacts

- Displacement
- Employment

- Traffic and Transportation

6.2.1 Effluent disposal

- Unintentional contamination of water resources
- Discharges during civil work (Construction Phase)
- Discharges during operations

Mitigation Measures (Addressing Environmental Problems)

- To achieve the desired quality of ground water RYK Energy Limited has installed tube wells at appropriate depth to fulfill the water requirements at the plant.
- Drinking water is obtained from the underground water resources. The drinking water will be regularly monitored by an external Laboratory to view any significant change in the quality.
- Waste water will be disposed off in Local Drain; which is a common drainage facility for the area around.

6.2.2 Solid Waste

- Solid waste is generated in civil work
- No solid waste generated during production

Mitigation Measures (Addressing Environmental Problems)

- The solid waste produced will be properly disposed off through available means. The proposed installation will improve the environmental level by decreasing the quantity of solid waste generated.

6.2.3 Particulate Matter

Dust emission may be of significant impact depending on the nature of the activity

- Civil work
- Production and manufacturing operations
- Traffic dust etc.

Mitigation Measures (Addressing Environmental Problems)

- Dust emissions (mainly common ambient air dust) will not be generated in significant quantities in operational phase.
- Emission and discharges during civil work will be duly and periodically monitored to prevent any adverse environmental impact.
- Dust generated in construction phase will be reduced by careful handling of the materials and processes.

6.2.4 Noise Level

The noise may be the result of the following activities:

- Civil Work
- Movement of Traffic

Mitigation Measures (Addressing Environmental Problems)

- The traffic schedule for loading and unloading constructional material shall be accordingly to avoid any disturbance and shall remain the minimum noise level.
- Personal Protective Equipment's (PPEs) shall be provided to the workers.

6.2.5 Water Resources

The water is available from following sources:

- Rain water for agriculture and surface storage.
- Surface water i.e. ponds and canals and
- Ground water i.e. wells and tube wells

The area is not deficient in water supply. Although this water is good for drinking purpose but water filter will also be installed to ensure the availability of clean drinking water.

Impact Analysis

Existing water sources have sufficient yield. Water quality in the area can be deteriorated through contamination by effluents or indirectly through seepage of water from contaminated soil. The potential sources of contaminants are liquid effluent and wastewater from different construction activities.

Mitigation Measures (Addressing Environmental Problems)

To avoid any undesirable impact on the water resources in the area following mitigation measures are recommended.

- Adopt a general strategy to avoid contamination of soil and ground water from construction and operational activities. The strategy may comprise of the following:
 - Minimized and controlled discharge of effluent
 - Adequate number of properly lined tanks, before the final discharge into the sewage system
 - Best effort/measures to be placed against accidental discharge and
 - Regular and scheduled monitoring to ensure that no contamination of soil and water has taken place.

These mitigation measures are adopted to ensure safety of the environment.

Table 6.1: National Ambient Air Quality Standards (NAAQS) 2004.

Pollutant	Averaging Times	Primary Standards.	Secondary Standards.
Carbon Monoxide	8-hour	9.5 ppm (10mg/m ³)	9.5 ppm (10mg/m ³)
	1-hour	35.5 ppm (40 mg/m ³)	35.5 ppm (40 mg/m ³)
Lead	Quarterly Average	1.5 µg/m ³	Same as Primary
Nitrogen Dioxide	Annual	54 ppb	Same as Primary
Particulate Matter (PM ₁₀)	Annual	51 µg/m ³	Same as Primary
	24-hour	155 ug/m ³	Same as Primary
Particulate Matter (PM _{2.5})	Annual	15.0 µg/m ³	Same as Primary
	24-hour	66 ug/m ³	Same as Primary
Ozone	8-hour	85 ppb	Same as Primary
	1-hour	125 ppb	Same as Primary
Sulfur Oxides	Annual	35 ppb	Same as Primary
	24-hour	145 ppb	Same as Primary
	3-hour	-----	550 ppb
Source: Vallero, D. A. 2004. <i>Environmental Contaminants: Assessment and Control</i> . Elsevier Academic Press. Boston. USA.			

Table 6.2: Ambient Air Quality Standards Method (EPA USA)

Ambient Pollution	Standards (ug/m) Maximum	Average Time
Total Suspended Particles	150 50	24-hour Annual average
PM ₁₀	100	24 hour
Sulphur Dioxide	350 200 50	1-hour 24-hour Annual average
Nitrogen Dioxide	200	24-hour
Carbon Monoxide	25000 10000	1-hour 8-hour
Lead	1.5	3-month average
Ozone	100	1-hour

**Table 6.3: Land Use Compatibility Matrix for Community Noise Environments
in the City of Hercules (USA)**

Land Use Category	Exterior Exposure DBA
Residential, Hotels, and Motels	50 to 60 dBA = Normally Acceptable 60 to 75 dBA = Conditionally Acceptable 75 to 85 dBA = Unacceptable
Outdoor Sports and Recreation, Neighborhood, Parks and Playgrounds	50 to 65 dBA = Normally Acceptable 65 to 80 dBA = Conditionally Acceptable 80 to 85 dBA = Unacceptable
School Hospitals, Personal Care, Meetings Halls, Churches s, Libraries, Museums,	50 to 60 dBA = Normally Acceptable 60 to 75 dBA = Conditionally Acceptable 75 to 85 dBA = Unacceptable

Office Buildings, Business Commercial and Professional	50 to 70 dBA = Normally Acceptable 70 to 80 dBA = Conditionally Acceptable 80 to 85 dBA = Unacceptable
Auditoriums, Concert Halls, Amphitheaters	50 to 70 dBA = Conditionally Acceptable 70 to 85 dBA = Unacceptable
Industrial, Manufacturing, Utilities, and Agriculture	50 to 70 dBA = Normally Acceptable 70 to 85 dBA = Conditionally Acceptable

6.2.6 Dust Emission from Roads

Vehicular movement on unpaved roads may result in the emission of dust. Studies [AP-42 Emission Factors from Stationary source, USEPA 1992] have been carried out on emission from stationary sources. Following data is available for vehicular movement on unpaved roads.

<u>Vehicle Type</u>	<u>Vehicle weight</u>	<u>Dust Emission</u> <u>(gms/vehicle/km)</u>
Particle size :< 10 microns		
Light Vehicles	<2 Tons	200 to 300
Heavy Vehicles	>2 Tons	500 to 600

Water will be sprinkled on all road surfaces on a regular basis. Continued practice shall reduce the dust emission to a lower level. Furthermore there are a small part of unpaved road which need to be sprinkled all other access roads are already paved and metalled. There are also no such sensitive receptors (houses, hospitals, schools and markets) adjacent to the proposed site. It is therefore, unlikely that limited dust emission from the project operations will create any health hazard or nuisance for the public.

6.3 Biological Resources

6.3.1 Flora Fauna

Impacts on Wildlife (if any)

Environmental Profile

Variety of resident birds, domesticated animals and few species of reptiles are found. No endangered species are reported in the area. During rainfalls, wild growth of species of shrubs and herbs is observed. No unique or endangered species of fauna are found in the project area. The parks and other recreational areas are insufficient. Flora Fauna study was conducted and important flora and fauna features have been incorporated.

Impact Analysis

Following was considered during the impact analysis of future activities in the operating area:

Similarly removal of vegetation directly may result in soil erosion, increase wind and runoff erosion and eventually adversely affect the soil stability.

These impacts are usually small scale and localized. Adverse impacts can be readily avoided by adopting simple precautionary and migratory measures. In most cases the impacts are insignificant.

- No endangered species or wildlife sanctuaries are reported to exist within the area.
- Through proper infrastructure design contamination of soil and groundwater can be minimized and;

Mitigation Measures (Addressing Environmental Problems)

Following Mitigation Measures are adopted to minimize impacts on wild life:

- No endangered species are reported to exist within the study area. All the necessary precautions will be taken to ensure the minimum disturbance to the local flora and fauna.
- Strict instructions to be given to all personnel working in project area to refrain from killing, capturing or disturbing any species of bird, reptile or mammal encountered during project activities, except in self defense.
- Removal of vegetation will be minimized.

- Appropriate mitigation measures will be introduced to minimize contamination of soil and ground water from construction activities.

6.4 Socio Economic

- Socio economic impacts of employment opportunities in the area

Social Impact of the Proposed Project

- a) Displacement: No displacement of population is envisaged.
- b) Employment: Employment opportunities generated by the project include construction labour at the site in the initial stages of setting up of the proposed facility, skilled and unskilled labour and security guards (chowkidars) during the Production phase. The officers for administration, marketing and maintenance will also be hired. Additional employment opportunities are envisaged, such as provision of daily raw materials. Reliance on local markets for provision of construction materials and other supplies will be a significant effect. Thus good amount of employment opportunities will be generated.
- c) Noise: the area is Commercial, still extra measure is taken into consideration so that the noise from the production process shall not exert any adverse impact on the community.

Mitigation measures (Addressing Environmental Problems)

Following mitigations are recommended for the anticipated social impacts:

- The civil work will be undertaken as such that negligible noise will be induced.
- Employment opportunities will preferably be provided to the locals in case of new requirement, if any.

Project's intended and Likely Benefits

The proposed project of RYK Energy Limited is intended to bring forth qualitative as well as quantitative benefits for the stakeholders belonging to various occupations and economy, especially those associated with energy sectors. The majority of the qualitative benefits are those that will be realized as a result of accomplishment of the

project and would continue throughout the lifespan of the project. Some of the significant quantitative benefits likely to accrue from the project can, however, be enumerated as under:

- The project indicators depict a positive cost to benefit ratio (CBR) showing that the project is feasible and is likely to bring forth economical and socio-economical benefits in its wake.
- The economic analysis of the project reveals an encouraging Expected Internal Rate of Return (EIRR)
- There will be an impetus to trade and business.

Overall Benefits of the Proposed Project

Like all developmental activities, the proposed project being a major development activity, is likely to have some direct or indirect impacts on the environment. The main impacts are likely to be due to project activities during the construction phase but a few may pertain to the operation and usage phase. The environmental impacts are likely to arise mainly from resource consumption, materials requirements, energy consumption, water requirements for project construction impacts on air quality and the socioeconomic impacts on the life style and social values. Many of the construction phase impacts are likely to abate with the completion of the construction phase e.g. noise, pollution, debris generation, material consumption etc. However, some of the impacts may be of permanent nature and may or may not be reversible.

The proposed project impacts on the physical, biological, ecological, social, economics and cultural environment have been discussed in detail in chapter on environmental impacts. Therefore, adjudging from the objective criteria of impact assessment strategy, the proposed project is feasible for implementation from environmental perspective. The likely drawbacks of the project during its operation phase are its impacts pertaining to air quality, liquid effluent generation, solid waste generation and the ambient noise. A large number of motor vehicles are expected to come to the project both during construction and operation phase. The high number of vehicles would complement concentration of exhaust pipe emissions from the

vehicles in a limited area. Therefore, the ambient level of emission gases especially carbon dioxide; nitrogen oxide and oxide of sulphur are likely to increase in atmospheric blanket. Similarly, there will be increased wastewater and solid waste generation from various activities and operations. Some of the likely qualitative impacts of the projects can be started as under:

- Increase in the job availability and diversification of the business and job market (positive impact)
- Availability of business facilities in a single premises (positive impact)
- Opportunity of new jobs and commercial / economic activities for the residents and others (positive impacts).
- Marring of ambient air quality due to large number of vehicle concentration in a limited area (negative impact)
- Noise pollution due to the usage of heavy machinery and vehicle concentration phase (negative impact)
- Impacts related to liquid wastewater and effluents, if not managed properly (negative impacts)
- Impacts relating to solid waste generation, if not managed properly (negative impact).

6.5 Ways of achieving mitigational measures

The mitigational measures devised for the proposed project has been mentioned in quite details in the previous section of this chapter. The monitoring plans and procedures have been discussed in quite details in chapter 7 as well. As mentioned in chapter 4 of this report, the project location is adjacent to the existing sugar mill; no population was relocated in any other part of the district. So no land acquisition and rehabilitation plans were necessary to be initiated and implemented. Compensation in terms of money and land cannot be devised technically as the land was owned by RYK Energy and was not brought from anyone.

Table 6.4: Impacts & Mitigation Measures

Potential issues	Impacts	Mitigation	Explanation
Construction phase			
1. Noise & Vibration	Main impact on the laborers/workers during the construction phase.	Proper shift hours for the labors will be scheduled to avoid any health risk.	RYK Energy Limited will ensure the implementation of SOPs.
2. Dust	Main impact on the environment & laborers/workers during the construction phase (clearing of land and excavation of land).	Water sprinkling would be ensured to minimize the dust arising during the construction phase. The provision of face mask and goggles also reduce the impact.	RYK Energy Limited will ensure the sprinkling of water and ensure the implementation of SOPs.
3. Exhaust	Exhaust gases would be mainly produced from the vehicles and the generators which produce NOx and SOx, which deteriorate the air quality and human health.	Generators and the vehicles would be properly maintained and emissions would be monitored on quarterly basis.	
4. Solid waste	Solid waste would mainly cause	Proper solid waste management	Solid waste management

	visual pollution as well as the mosquitoes breeding area which mainly cause biological hazards in the nearby areas.	would be ensured and if any waste is found it would be recycled and any other waste would be sold to the contractor.	would be done according to the SOPs.
5. Soil contamination	Soil contamination would be mainly caused by the construction activity and the spillage of fuel from the vehicles.	Vehicles would be properly maintained and the construction material would be used for the filling purpose. However in case of spillage, spill kits would be used.	
6. Waste water	Waste water would be mainly produced from the labors camp.	Generated waste water would be treated in the septic tank.	
7. Biological Aspect	The flora and fauna will not be harmed with the proposed project.		
8. Social Aspect	The residents and employees would not be greatly affected by the impacts during	Noise has been monitored to carry out and duly monitored regularly to	Maintenance of vehicles and traffic noise would be properly controlled and managed.

	construction phase.	comply with statutory requirements.	
Operational phase			
1. Noise & Vibration	It would be mainly produced due to the machinery used to pump water, which will impact the workers.	The machinery would be properly maintained and inspected time to time.	RYK Energy Limited ensures the maintenance of the machinery and implementation of the SOPs.
2. Solid waste	Solid waste would mainly cause visual pollution as well as the mosquitoes which mainly cause biological hazards in the nearby areas.	Proper solid waste management would be ensured and if any waste is found it would be recycled and any other waste would be sold to the contractor.	Solid waste management would be done according to the SOPs.
3. Soil contamination	Soil contamination can take place in due to unintentional spills.	These spills would be mainly controlled by spill kits.	-

4. Biological Aspect	During operational phase no damage or harm will occur to flora and fauna.	Disturbance to breeding habitats from noise and vibration during operational phase; and adverse effect to the air quality within the site during the operational phase, which will be duly monitored.	Sprinkling of water to trees and flower bearing plants shall be ensured.
5. Social Aspect	During operational phase no disturbance to residents and employees occur.	Minor addition to the existing noise levels; dust/particulates and gaseous emissions from the generator running turbine will be dissipated by the unutilized vast carrying capacity of the ecosystems.	RYK Energy Limited ensures the maintenance of the machinery and implementation of the SOPs.

Chapter - 7

ENVIRONMENTAL MANAGEMENT PLAN

Chapter – 7

ENVIRONMENTAL MANAGEMENT PLAN

Although adequate measures have been identified in this IEE report to anticipate or mitigate possible adverse environmental impacts of the proposed project area, yet ensure that these measures are incorporated into the overall design, it is necessary that all these impacts are arranged in an illustrative environmental management plan which may be used as a cross check list or a reference point. This section outlines such a plan. The plan addresses the mechanism through which the proposed measures may be implemented; identifies the responsibilities of the project sponsors and contractor (if any); develops a system of checks and balances; proposes actions to be taken by each role player; and lays down the required documentation, communication and reporting procedures. It may however be noted that EMP is not a part of IEE and is only included in this report for illustration.

7.1 Goals of Environmental Management Plan

The following may be the primary goals of the environmental management plan:

- Ensure implementation of mitigation measures proposed in the likely EMP report
- Ensure that the operators and their contractors meet all environment-related legal obligations
- Provide a mechanism for taking timely actions for unanticipated environmental situations
- Define the various role-players' responsibilities and provide a means of effective communication of environmental issues among them

7.2 Organizational Structure and Responsibilities

The organizational structure for the likely environmental management plan may be as follows:

Management and Control

- Conducting the development activities in an environmentally sound manner would be the responsibility of the Project Manager

On Job Supervision and Monitoring

- Contractor will be responsible for ensuring compliance with the environmental management plan at the operational level. He would also be responsible for informing staff in all aspects of the environmental management plan
- Manager would also be responsible for monitoring implementation of the Environmental Management Plan
- If any monitoring teams from government departments or NGO's visit the site during operations, the General Manager/Director would be responsible for coordinating with them

7.3 Environmental Control Measures

The entire operation will be conducted with a strong emphasis on health and safety and environmental protection. Generic environmental control measures are described in the following sections.

7.3.1 Site Selection and Acquisition

The measures given below would be implemented prior to the commencement of works.

When determining the location for construction an effort should be made to keep the:

- The population from being exposed to any adverse environmental impacts
- The water sources unpolluted
- Disturbance to the areas with much natural vegetation

7.3.2 Access Track Development/Upgrade

- The constructions of new access tracks would not be carried out. Vehicles will generally not be driven onto agricultural fields or through the settlements
- Clearing of vegetation would be minimized. Trees will not be cut down
- Isolated trees and significant stands of vegetation will be left undisturbed if practically possible
- No natural drainage paths will be blocked or filled

7.3.3 Vehicle Operation

RYK Energy Limited would ensure the safe movement of vehicles within the site. The movement of cars within the site is subjected to the following conditions:

- Limit vehicle speed to avoid accidents
- Vehicles are to be properly tuned and should not emit abnormal emissions
- Use vehicles with proper exhaust mufflers (silencers)
- Ensure that the effluents/washings are properly contained in the septic tanks and are not released before treatment
- Periodic checks for leaks under all operating vehicles; contaminated soil should be removed by proper disposal
- Ensure that noise from the operations is kept as low as possible

7.3.4 Waste Disposal

The following measures would minimize the adverse impacts associated with waste disposal.

- Lined septic tank(s) would be used for sewage treatment, before the final discharge in the sewerage system
- Septic tanks would be large enough to contain the site wastewater and rainwater
- Septic tanks would be covered to reduce access of insects and animals
- Food wastes would not be disposed off in the open
- Waste bins would be emptied daily; combustible waste will be incinerated regularly
- Hazardous materials (if any) would not be incinerated, spilled or spread on the ground

- All recyclable garbage would be collected and sold to local contractors
- All leftover refuse and garbage that cannot be incinerated or sold would be buried at a suitable location

7.3.5 Hazardous Materials

Chemicals

No particular chemicals will be required in the construction activity but if used chemicals will be handled and disposed off using the guidelines given below.

- No additional storage facility is required for storage of raw material and chemicals
- Chemical store should not have seepage and should have spill containment areas
- Chemicals should be stored in a manner that minimizes the potential for spills
- Tools and materials should be available to clean up any spills or drips
 - Equipment should include absorbent material, shovels, and plastic bags
 - The absorbent material should be a color contrasting with the background to avoid being left on the ground after the cleanup
- Spills or leaks of oil or fuel should be cleaned up and disposed of properly.
- All spills or leaks should be reported in accordance with EMP and local regulation
- Chemical storage containers should be inspected routinely
- Drums should be stored above the ground to prevent corrosion and to facilitate leak detection.
- All chemical containers or drums must be marked with their contents and the name of the company that owns or operates them
- Material Safety Data Sheet (MSDS) should be present for all the stored and used chemicals
- Ensure that any hazardous chemicals used by the workers are handled correctly and that the safety information provided by the manufacturer is available and understood by the worker
- Hazardous Waste chemicals should be disposed off in the manner approved by regulations (MSDS etc.)

Leaks/Spills

- Tools and materials should be available to clean up any spills or drips.
- Equipment should include absorbent material, shovels, and plastic bags.
- The absorbent material should be a color contrasting with the background to avoid being left on the ground after the cleanup.

7.3.6 Social

- The proposed project is to be constructed on an open plot, which requires cleaning. The proponent will pay their due role in improving the existing condition.
- The proposed project will also enhance the uplift of the area
- There is no nearby public park, so there would be no exploitation of public entertainment area.
- Local labor, which constitutes skilled and unskilled labor, should be utilized to the maximum possible extent.

7.3.7 Biological Resources

The proposed project is going to initiate in an open plot. There will be no interaction between wildlife and the workers in the project area. The control measures given below will be followed when animals are encountered.

- A 'no-hunting' policy will be strictly enforced. Animals and birds will not be captured, harassed or trapped. The buying of wild animals or birds by project personnel will also be prohibited
- Report incidents and any significant problems with animals and birds to the appropriate authorities
- Intentional harassment of animals is not permitted
- Pets are not to be allowed in the project area
- Noise from the work areas will be minimized through the use of mufflers on all machinery and vehicles, and the construction of noise barriers where necessary
- Movement during the night will be kept to a minimum

- Wash down equipment to avoid transporting seeds or plant diseases to non-native areas
- Minimize the cutting of trees (if any) and clearing of vegetation
- Open fires will not be allowed anywhere
- Plan and implement afforestation measures (To prevent adverse impacts on the vegetation and ecology of the project area, it will be ensured that the trees are planted at the site are all native species)
- Water contaminated during the operation activities will not be released into the open area, as this may be harmful to vegetation or wildlife. All such effluents will be directed to the appropriate disposal points
- The green belt along the periphery of the plot shall be provided in the open space available. The other open spaces inside the plot shall be suitably landscaped and covered with vegetation of indigenous variety

7.3.8 Plantation Plan

- Trees will be planted over all the open areas which will consist of trees of various species most suited to the site. The main Tree Species will be planted are Shisham (*Dalbergia sissoo*). Anar, Paper Mulberry, Jamin, Eucalyptus, Sukhchain, Table Palm, Bakain, Neem, etc.
- The area marked as green area shall be used only for greenbelt and shall not be altered for any other purpose.

7.3.9 Waste Water

- RYK Energy Limited shall treat its sewerage water generating from the proposed project in its sewage treatment plant consisting of primary and secondary treatment facility. In the case of the discharge of excess sewage if any, it shall be made after due treatment conforming to the norms stipulated by EPA for further treatment. In no case, sewage shall be disposed either on road or under ground. All necessary payments shall be made to the urban local bodies for collection, treatment and safe disposal of sewage from time to time.

7.3.10 Traffic Management

- The area marked for the parking shall be used for parking only. No other activity shall be permitted in this area.
- Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. The applicant shall deploy necessary parking management system to ensure that the visitors do not park their vehicles on either of the roads adjoining to the site in question.
- Necessary signage including continuous display of status of parking availability at entry, exit and all other appropriate places shall be provided which should have appropriate size of letters and shall be visible from at least 50 meter distance.
- No public space including the service road shall be used or blocked for the parking and the trained staff shall be deployed to guide the visitors for parking and helping the senior citizens and physically challenged people to park their vehicles at appropriate parking places.

7.3.11 Historical, Archeological and Cultural Sites

There are no known sites of historical, archeological, or cultural significance within the project area. But in Rahim Yar Khan City some of the documented or protected sites are Baghla Fort, Islam Garh Fort, Khair Garh Fort, Mau Mubarik Fort, Pattan Minar, Bhong Mosque, Palace Sultan of Abu Dhabi etc.

7.3.12 Health, Safety & Environment

- The construction site shall be provided with adequately barricades of at least 3m height on its periphery with adequate signage.
- Adequate first aid facilities shall be provided in the project both during the construction as well as the operation of the project.
- Adequate drinking water and sanitary facilities should be provided for construction workers at the site.
- The safe disposal of wastewater and solid wastes generated during the construction phase should be ensured.
- Provision should be made for the supply of fuel (kerosene or cooking gas), utensils such as pressure cookers etc. to the laborers during construction phase.

- Adequate personal protective equipments shall be provided to the construction workers to ensure their safety and the applicant shall ensure its usage by the laborers.
- Use of diesel generator sets during construction phase should be enclosed type and conform to EPA Rules for air and noise emission standards.
- Vehicles hired for bringing construction material at site should be in good conditions and conform to applicable air and noise emission standards and should be operated only during non-peak hours.
- Fly ash building materials should be used in the construction to the extent possible.
- Structural design aspects in accordance to the seismic zone shall be strictly adhered to.
- Necessary permissions from the Central Ground Water Authority shall be obtained for the bore wells.
- The construction materials and debris shall be properly stored and handled to avoid negative impacts such as air pollution and public nuisances by blocking the roads and public passages.
- Environment Management Cell shall be formed, which will supervise and monitor the environment related aspects of the project during construction and operational phases.
- Dust emissions (mainly common ambient air dust) will be generated in the construction phase and operation phase. The employees will be provided and instructed to wear the goggles and dust masks, whenever and wherever required.
- Emissions and discharges during civil work during construction phase will be duly and periodically monitored and controlled to prevent any adverse environmental impact.
- Dust generated in the construction phase will be reduced by careful handling of the materials and processes. Use of goggles, safety shoes and helmets are mandatory for the contractors as per RYK Energy Limited Environmental, Health & Safety policy.
- Safety Instructions like safety signs are designed for this purpose and will be displayed at relevant places.
- RYK Energy Limited will vaccinate their employees against any spread epidemic.

7.3.13 General

- Ensure that no trash, wrappers, shopping bags, paper, cans, bottles, or any other kind of litter is thrown in the open
- Ensure that existing trails are used while walking
- Ensure strict adherence to safety measures
- Domestic animals will not be fed.
- The use of chlorofluorocarbons (CFCs) will be avoided as far as possible.

7.3.14 Restoration and Reclamation

- All staff will be responsible for ensuring that no refuse is left in their work areas. In some cases it may be necessary to employ additional employees for cleaning (sweepers etc).

7.4 Monitoring

The success of any environmental management plan depends upon effective monitoring. Through monitoring, strict adherence to the environmental control measures and disciplines will be ensured. This activity will also provide a record of all incidents of environmental significance and related actions and mitigation measures. In addition, it will facilitate the evaluation of the effectiveness of the control measures and the identification of any additional mitigation measures needed.

7.4.1 Monitoring Approach

The following types of monitoring will be conducted during the construction activity:

1. Confirmation through Environmental Protection Department Punjab (EPD), regarding the indication of the monitoring category in which the proposed project will fall (See Pakistan Environmental Protection Act).
2. Environmental monitoring will be carried through a certified environmental laboratory as per the country's requirement.
3. Random and periodic checks on the activities of the workers will be conducted to verify adherence to control measures.

4. Independent Monitoring: Random site visits by the environmental experts to ensure proper monitoring and strict compliance with environmental requirements.

7.4.2 Operational Activity Monitoring

Manager at the site will be responsible for the following:

1. Conduct random checks of activities of the staff.
2. Keep records of any spill, leak, or any other event that damages or can potentially damage the environment
3. Record any violations of environmental guidelines
4. Record remedial actions taken for any environmental mishaps or violations.
5. Report and Record any accidents/incidence etc.
6. Ensure compliance with the EMP.

7.4.3 Independent Monitoring

All operation activities will be monitored closely from an environmental perspective through a certified laboratory. The primary objective of this phase of the monitoring will be to ensure that the environmental control measures are strictly followed.

7.4.4 Fire Management

The Management shall ensure that:

- The Fire Safety Management needs are considered for all areas.
- Hydrants and fire extinguisher will be available at site.
- Layout plan will be displayed at the site.
- Fire exit will be readily accessible which would not be used otherwise.
- Necessary emergency lighting system along with emergency power back up system shall be provided. In addition, emergency public address system arrangement and signage for emergency exit route shall be provided on each floor.
- Necessary auto glow signage at all appropriate places shall be provided to guide the people towards exits and assembly points during the unforeseen

emergency and untoward conditions.

- Training to the staff for the first aid and fire fighting along with regular mock drill shall be made an integral part of the disaster management plan of the project.

7.5 Institutional Capacity

RYK Energy Limited, a public (unlisted) company, owns and operates 13,000 TCD sugar mill with 30 MW power house. The mill is located at Janpur, district Rahim Yar Khan. The company commenced commercial operations in December 2008. The company is engaged in the manufacturing and sale of sugar (including by-products such as molasses), and the generation and sale of 30MW (Gross) electricity to the National Grid. The company produces power through burning of bagasse, a waste product from sugarcane processing, to meet its captive requirements. RYK Energy has sufficient trained professional for the initiation and the implementation of the proposed management plans, before, during and after the construction of the proposed project. The details of the impacts and the mitigation during all the phases of the project have been mentioned in **Table 7.1**. The table clearly shows responsible team for the monitoring of all the components of the proposed project.

7.6 Training Schedules:

RYK Energy are the well renowned sugar mill of Pakistan. As mentioned in the previous section, the mill owns a sufficiently trained staff for all of its activities within the vicinity of the industry. No separate staff training program would be initiated and implemented for the proposed project. The industry reserves the right to keep its training schedules and the training programs confidential. RYK Energy has ensured that the regular training of all of its professionals and supporting staff members would be carried out in its own fashion and according to its pre-defined training schedule.

7.7 Equipment Maintenance details

The details of plant equipment and their maintenance is a confidential matter of RYK Energy. However, on the special request on the behalf of EPA, plant and equipment maintenance form normally used in the industry was prepared and shared with EPA. The form has been attached as **Annex Q** of this Report. The form attached is self-explanatory and contains relevant columns explaining the whole plant and maintenance programs and schedules.

7.8 Environmental Management Budget

The proposed environmental management budget for the 36MW Bagasse fired power plant is approximately around 1 Million Pakistani Rupees.

Table 7.1: Roles and Responsibilities for Environmental Monitoring of Proposed Project

Sr. No.	Aspects	RYK Energy Limited Responsibilities	Contractors Responsibilities	Relevant Documentation
1	Contracting	Requirements will be communicated to the contractor(s)	Understand the requirements and estimating the required resources	Copy of instructions
2	Mitigation and monitoring Plan	Finalize the monitoring plan prior to commencement of construction	None	Revised Monitoring plan
3	Environmental Staff	Designate an Environmental Manager for the project	Appoint an officer dedicated to environment (may be combined with health and safety)	Job descriptions
4	Corrective actions	Verify that the activities are carried out comply with them IEE/EMP and identify corrective actions, if required	Carry out the required corrective actions	Corrective action record

Table 7.2: Environmental Monitoring and Management Plan (EMMP) for Construction Phase

Sr. No.	Impacts	Parameters to be Monitored	Monitoring Frequency	Responsibility
1	Vehicle, equipment and exhaust emission	Air quality through visual inspections	Weekly during peak construction period	Contractor / RYK Energy Limited Construction Supervisor
2	Construction Noise	Noise level inside and outside the plant boundary	Regularly during peak construction period (civil works)	Rahim Yar Khan factory's Construction Supervisor
3	Emergencies and Accidents	Frequency of accidental injury and care provided	Daily during peak construction period	SHE staff of RYK Energy Limited
4	Traffic	Traffic flow on main road and number of accidents due to vehicles of RYK Energy	Sudden inspection on main roads at the time of material transport	Rahim Yar Khan factory's Construction Supervisor
5	Water	Water quality of wastewater disposal channel of RYK Energy	Weekly during peak construction period	RYK Energy Limited SHE staff
6	Construction Dust	Air quality through visual dust emission	Regularly during peak construction period	Contractor / RYK Energy Limited Construction Supervisor
7	Terrestrial Ecosystem	Water consumption and treatment	Regularly during construction period	RYK Energy Limited SHE manager
8	Solid Waste	Water generation and disposal	Regularly during construction period	RYK Energy Limited SHE staff
9	Employment	Employee record at the time of staff development	At the time of recruitment	RYK Energy Limited Construction Supervisor

Table 7.3: Environmental Monitoring and Management Plan (EMMP) for Operational Phase

Sr. No.	Impacts	Parameters to be Monitored	Monitoring Frequency	Responsibility
1	Noise	Noise level inside and outside the plant boundary	Periodic during operational life	SHE staff of RYK Energy Limited
2	Liquid Waste	Water Quality of Waste Water Treatment Plant	Periodic after commencement of proposed project	SHE staff of RYK Energy Limited
3	Emergencies, PPEs and Accidents	Frequency of accidents, action taken. No. of injuries and care provided	Regularly after commencement of proposed project	SHE staff of RYK Energy Limited
4	Solid Waste	Record keeping of amount of waste generated and disposal practice	Regularly	SHE staff of RYK Energy Limited

Chapter - 8

CONCLUSION

Chapter - 8

CONCLUSION

The IEE of the proposed project of RYK Energy Limited has achieved the following goals:

- Identification of national environmental regulatory requirements that apply to the proposed development activities
- Identification of the environmental features of the project area and the likely impact of the project on the environment
- Recommendation of appropriate mitigation measures that RYK Energy Limited will incorporate into the project design to eliminate or mitigate all adverse environmental impacts

Baseline environmental and socio-economic information was collected from variety of sources, including published literature and field surveys. The information collected was used to compose profile of the natural and socio economic environment likely to be affected by the project. Information for the section describing the project came mainly from the proponent.

The assessment was then made of the potential impacts of the described project on the area's natural and socioeconomic environment.

The adverse impacts of the proposed project in most of the project area will be insignificant, but the positive impacts of improved efficiency, productivity and self-reliance will enhance the consistency in production, quality and employment levels in the region due to project activity and project operation.

Additional mitigation measures are given to reduce impacts, to as low as reasonably possible. The proposed project is a shining example of investment by the company in Pakistan during the prevailing national energy crisis.

After assessing the proposed project activity and investigating the project area, the environmental consultants, ECO have concluded that:

“If the activities are undertaken as proposed and described in this report, and the recommended mitigation and environmental management measures are adopted, the project will not result in any long term or significant impacts on the local community and environment”.

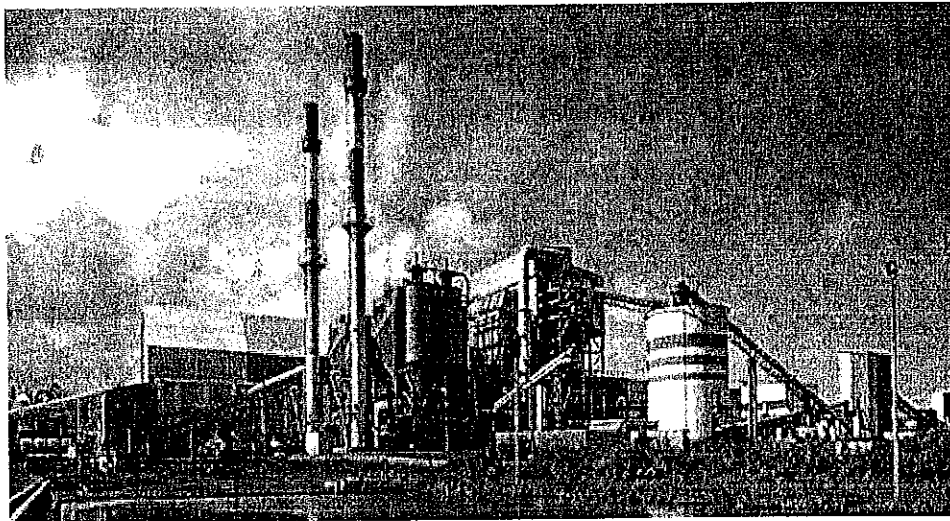
Therefore no Environmental or Social Impact Assessment (ESIA) is required for this project. Consultants accordingly recommended without any reservation that no objection certificate (NOC) may be issued allowing the commencement of the construction of the project.



INTERCONNECTION STUDY

For

25 MW RYK ENERGY LTD. POWER PLANT FOR SUPPLY OF 22.8 MW SPILLOVER TO THE NATIONAL GRID



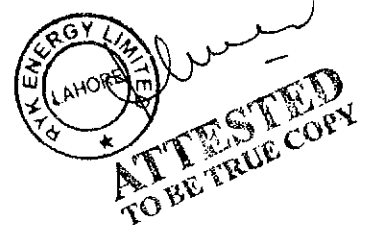
*Final Report
(November 2016)*

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Executive Summary

- ❖ The Final Report of 25 MW RYK Energy Ltd. for the Supply of 22.8 MW spillover to the national grid is submitted herewith.
- ❖ R.Y.K Mills Limited has already installed of 2 x 15 MW (each) generating units; RYK Energy Limited now intends to add another unit of 25 MW at the same location.
- ❖ It would like to go for high pressure cogeneration in the sugar mill with the aim of exporting power nearly 22.8 MW to the national grid during the crushing and the Non-crushing season.
- ❖ The study objective, approach and methodology have been described and the plant's data received from the Client is validated.
- ❖ The system data of NTDC has been used as per permission granted by NTDC vide their letter No. GMPP/CEMP/TRP-333/3208-11 dated 07/08/2015.
- ❖ The nearest interconnection facility is the 132 kV substations of Khanbela and Feroza. The 132 kV single circuit line from Feroza to Ahmedpur-East lies at about 20 km from the site of RYK Energy Ltd.
- ❖ Due to the location of RYK Energy Ltd., the most feasible interconnection scheme would be looping in-out the existing 132 kV circuit between Feroza to Ahmedpur-East at RYK-Energy Ltd. PP, as had been done for RYK Mills Ltd. The upcoming chapters discuss in detail the location and interconnection of the new unit. A few approximate sketches are shown in Appendix-B.
- ❖ The two breaker bays of 132 kV at RYK-Energy Ltd. PP to connect with the 132 kV circuits each from Feroza and Ahmedpur East respectively are already installed for RYK Mills Ltd.
- ❖ In view of planned COD, of the RYK-Energy Limited in April 2018, the above proposed interconnection scheme has been assessed for steady state conditions through detailed load flow studies, short circuit analysis and stability criterion for the maximum load in the system i.e. September 2018.
- ❖ Steady state analysis by load flows, short circuit and stability criterion reveals that proposed scheme is adequate to export 22.8 MW output of the plant under normal and contingency conditions.



- ❖ Load flow analysis has also been carried out for the crushing month of January 2019 with the maximum thermal dispatch in the system.
- ❖ In an extended term scenario, September 2021 has been studied to evaluate the performance of the proposed interconnection scheme. The system conditions of normal and N-1 contingency have been examined for all scenarios to meet the reliability criteria. Along with it, short circuit and dynamic stability analysis have been carried out for a complete check of the system.
- ❖ The short circuit analysis carried out to calculate maximum fault levels at RYK-Energy Limited and the substations of 132kV in its vicinity reveals currents for the proposed scheme are much less than 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 RYK-Energy Limited.
- ❖ The dynamic stability analysis of proposed scheme of interconnection has been carried out. The stability has been tested for the worst cases, i.e. three phase fault right on the 132 kV bus bar of RYK-Energy Limited substation followed by the final trip of 132 kV circuits emanating from this substation has been performed for fault clearing of 5 cycles (100 ms), as understood to be the normal fault clearing time of 132 kV protection system. Also the extreme worst case of stuck breaker (breaker failure) has been studied where the fault clearing time is assumed 9 cycles i.e. 180 ms has been analysed for single phase fault. The stability of system for far end faults of 3-phase occurring at Feroza 132 kV and Ahmed Pur East 132 kV bus bars has also been checked.



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Appendices

Appendix –A: Generation, Transmission Plan and Load Forecast for Chapter – 4

Appendix –B: Map & Sketches for Chapter – 4

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



1. INTRODUCTION

1.1 Background

RYK Mills Ltd. Power Plant is a Cogeneration plant near Khan Bela in District Rahim Yar Khan embedded in the distribution network of MEPCO. Currently, it has a generation capacity of 30 MW. It has two generating units, 2 x 15 MW, which not only meet its own load demand but also provide a spillover of 19 MW to the national grid. The plant successfully achieved its COD in 2015 and has been serving its purpose ever since. It is located nearly 6-7 km from the existing Khanbela 132 kV Substation in the concession area of Multan Electric Power Company (MEPCO). A general idea of the location of plant and grid stations in its vicinity can be viewed in sketch-1 attached in Appendix-B.

RYK Energy Ltd. aims to install a 25 MW unit, in the same region, and go for high pressure cogeneration in the sugar mill with the aim of exporting 22.8 MW power to the grid during the crushing season and a little while after it i.e. for the months of April to August having sufficiently arranged for bagasse. The project is expected to start commercial operation by April 2018. The electricity generated from this project would be supplied to the grid system of MEPCO through 132 kV grids, as that of Khanbela, Feroza and Ahmadpur East, available in the vicinity of this project. The location of RYK Energy Ltd can be seen in sketch-2 attached in Appendix – B.

1.2 Objectives

The overall objective of the Study is to evolve an interconnection scheme between RYK Energy Ltd. Power Project and MEPCO network, for stable and reliable evacuation of 22.8 MW of electrical power generated from this plant, fulfilling N-1 reliability criteria. The specific objectives of this report are:

- To determine the performance of interconnection scheme during steady state conditions of system, normal and N-1 contingency, through load-flow analysis.
- To check if the contribution of fault current from the plant unit 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 RYK Energy Ltd. PP.

- 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 - 50.5Hz, Min/Max Contingency Freq. Band
Power Factor	0.8 Lagging; 0.85 Leading

Short Circuit:

132 kV Substation Equipment Rating 31.5 kA or 40 kA

Dynamic/Transient:

The system should revert back to normal condition after dying out of transients without losing synchronism with good damping

- a) 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.
- b) Failure of a circuit breaker to clear a fault ("Stuck Breaker" condition) in 5 cycles, with back up clearing in 9 cycles after fault initiation.



2. ASSUMPTIONS OF DATA

The number of new generating units at RYK-Energy Ltd. PP will be one. As per the data provided by the client the following assumptions have been made:

2.1 RYK Energy-PP Data

Installed capacity of power plant	= $1 \times 25 = 25$ MW
Net Capacity of power plant	= 22.8 MW
Lump sum maximum generating capacity	= 25 MW
Power factor	= 0.80 lagging, 0.85 leading
Lump sum MVA capacity	= 1×31.25 MVA = 31.25 MVA
Inertia Constant	= 2.642 MW-sec/MVA
Generating Voltage	= 11 kV
Transformer Rating	= 40 MVA

2.2 Network data

The 132 kV network in the area near RYK-Energy Limited Power Project are as shown in Sketches in Appendix-B. The system data of NTDC has been used as per permission granted by NTDC vide their letter No. GMPP/CEMP/TRP-333/3208-11 dated 07/08/2015. The latest Generation Expansion Plan and Load Forecast has been used as provided by NTDC via letter No. GMPP/CEMP/TRP-393/2112-15 and is shown in Appendix-A. The network of MEPCO in the vicinity of RYK Energy Ltd. was verified during a visit of the site by PPI engineers. Further verification of the network was done during meetings between MEPCO GSO and Planning engineers and PPI engineers during the same visit.



3. STUDY APPROACH AND METHODOLOGY

3.1 Understanding of the Problem

RYK Energy Ltd. intends to increase generating capacity in the same region as that of RYK Sugar Mills, by adding a 25 MW unit of its own. The maximum spillover to the National Grid from the site will be about 22.8 MW of electrical power during the crushing season and a little while after it.

The interconnection scheme is the same as that of RYK Sugar Mills PP i.e. looping in and out of Ahmedpur-East and Feroza 132kV single circuit. As the Transmission lines have already been constructed and it will be enough to accommodate the power of RYK Energy power plant.

RYK Energy PP added to the existing network is shown in Sketch-2 in Appendix-B. The proposed power plant embedded in local network in this area shall provide relief to the source substations such as R.Y Khan and Guddu which are feeding the local network distantly.

The adequacy of MEPCO network of 132 kV in and around the proposed site of RYK-Energy PP would be investigated in this study for absorbing and transmitting this power fulfilling the reliability criteria.

3.2 Approach to the problem

The following approach has been applied to the problem:

- A base case network model has been prepared for the year 2018, in which the peak load scenario will occur after the commissioning of RYK-Energy PP in April 2018, comprising all 500kV, 220kV and 132 kV system, envisaging the load forecast, the generation additions and transmission expansions for that year particularly in MEPCO.
- Month of September 2018 has been selected for the study because it represents the maximum loading conditions during the crushing season after the COD, of RYK-Energy Power Project. Thus, lines in the vicinity of this plant will be loaded to the maximum extent, allowing us to judge the complete impact of the plant on the transmission system in its vicinity.



- The month of January 2019, has also been completely analyzed for the system, considering maximum thermal dispatches.
- Load flow, short circuit and dynamic stability studies have also been performed for September 2021 to see the performance of the proposed plant in extended term scenario as per NTDC's requirement.
- Interconnection scheme without any physical constraints, like right of way or availability of space in the terminal substations, have been identified.
- Perform technical system studies for peak load conditions to confirm technical feasibility of the interconnections. 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.
- Determine the relevant equipment for the proposed technically feasible scheme.
- Recommend the technically most feasible scheme of interconnection.



4.DEVELOPMENT OF SCHEME OF INTERCONNECTION

4.1 The Existing and Ongoing Network

RYK-Energy Limited is in proximity of RYK Mills Ltd. Both enterprises are located near Khan Bela in District Rahim Yar Khan embedded in the distribution network of MEPCO. RYK Mills PP (2 x 15 MW) is connected with Feroza 132 kV and Ahmedpur East 132 kV by looping in-out the 132 kV circuit between Feroza and Ahmedpur East. The distance of the plant from the looping point is about 20 km. The conductor used is 132 kV Lynx conductor. Following the same connectivity RYK Energy Ltd. power plant of 25 MW is being added into the current system.

The 132 kV double circuits from Khanpur to Bahawalpur-New pass in the vicinity of RYK-Mills Ltd. PP. The circuit on the side facing RYK-Mills Ltd. PP, loops in-out Feroza, Ahmedpur East and Mubarakpur Substations while the other side of it connects via Hamza Sugar Mills, Samasatta and Liaquatpur.

There is a strong 220 kV network in the vicinity connecting Guddu 220/132 kV grid station with Shikarpur 220 kV, Sibbi 220 kV and Guddu 500 kV substations. The R.Y. Khan 220/132 kV substation will also be present in the vicinity. A strong system helps in stable operation of a power plant.

4.2 The Scheme of Interconnection of RYK- Energy-PP

Keeping in view of the above mentioned 132 kV network available in the vicinity of the site of the RYK-Energy Ltd. PP, the interconnection is the same as that of RYK Mills-PP i.e. already installed looping in-out the 132 kV circuit between Feroza and Ahmedpur East. This proposed interconnection scheme is shown in Sketch-2 of Appendix-B.



5. DETAILED LOAD FLOW STUDIES

The base cases have been developed for the peak conditions of September 2018 using the network data of NTDC and MEPCO available with PPI. The peak loads of the year 2018 for MEPCO have been modeled as per the latest PMS Demand forecast as provided by NTDC. Detailed load flow studies have also been carried out for January 2019 and future case September 2021.

5.1 Peak Load Case 2018

The peak load case in September 2018 has been studied in detail for the conditions of without and with RYK Energy Ltd. PP respectively.

5.1.1 Without RYK-Energy-Power Plant

The results of load flow analysis with RYK-Mills-PP, but without RYK-Energy-PP have been plotted under normal conditions in Exhibit 0.0 in Appendix-C. 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 0.1: RYK-PP to Ahmadpur.East 132kV Single Circuit Out
- Exhibit 0.2: Feroza to RYK-PP 132kV Single Circuit Out
- Exhibit 0.3: Mubarakpur to Ahmadpur.East 132kV Single Circuit Out
- Exhibit 0.4: Bhawalpur New-II to Mubarakpur 132kV Single Circuit Out
- Exhibit 0.5: Feroza to Khanpur 132kV Single Circuit Out
- Exhibit 0.6: RYK-New to Feroza 132kV Single Circuit Out
- Exhibit 0.7: RYK-New to Khanpur 132kV Single Circuit Out

It can be noted that for the contingency case of Exhibit 0.4. There exist some under voltages in the system.



5.1.2 With RYK Energy Power Plant

The scenario of RYK Energy Ltd. PP after the COD of the plant when it starts exporting 22.8 MW to the MEPCO network has been studied. The scheme of interconnection modeled in the load flow for RYK-Energy-PP is by looping in-out the Feroza - Ahmedpur-East 132 kV single circuit at RYK-PP 132kV. This unit has been added in the similar manner as that of RYK-Mills-PP. The results of load flows with RYK-Mills-PP and RYK-Energy-PP under normal conditions have been plotted in Exhibit 1.0 in Appendix-C.

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 1.1: RYK-PP to Ahmadpur.East 132kV Single Circuit Out
- Exhibit 1.2: RYK-PP to Feroza 132kV Single Circuit Out
- Exhibit 1.3: Mubarakpur to Ahmadpur.East 132kV Single Circuit Out
- Exhibit 1.4: Bhawalpur New-II to Mubarakpur 132kV Single Circuit Out
- Exhibit 1.5: Feroza to Khanpur 132kV Single Circuit Out
- Exhibit 1.6: RYK-New to Feroza 132kV Single Circuit Out
- Exhibit 1.7: RYK-New to Khanpur 132kV Single Circuit Out

We find that 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. It can also be noted that the under voltages which appear without the plants have been resolved. So the proposed plant helps in solving the voltage constraints of MEPCO system. We find no capacity constraints on 132 kV circuits under normal and contingency conditions.

5.2 Peak Load Case 2019: Winter Scenario

The scenario of RYK Energy Ltd. PP during the winter season, for the month of January with maximum thermal dispatches, has been studied. Some other plants have also been included in this scenario such as Ittefaq and Bahawalpur Energy. The results



of load flows with RYK-Mills-PP and RYK-Energy-PP under normal conditions have been plotted in Exhibit 2.0 in Appendix-C.

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 2.1: Ittefaq-PP to RYK-PP 132kV Single Circuit Out

Exhibit 2.2: RYK-PP to Feroza 132kV Single Circuit Out

Exhibit 2.3: Ahmadpur.East to Mubarakpur 132kV Single Circuit Out

Exhibit 2.4: Bhawalpur New-II to Mubarakpur 132kV Single Circuit Out

Exhibit 2.5: Feroza to Khanpur 132kV Single Circuit Out

Exhibit 2.6: RYK-New to Feroza 132kV Single Circuit Out

Exhibit 2.7: RYK-New to Khanpur 132kV Single Circuit Out

We find that 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 no capacity constraints on 132 kV circuits under normal and contingency conditions.

5.3 Peak Load Case 2021: Extended Term Scenario

We have also studied the future scenario of September 2021 to assess the impact of the plant in the extended term of its installation as per NTDC requirement.

Exhibit 3.0 shows the normal case of 2021 of the region with RYK-Energy-PP. 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 3.1: RYK-PP to Ittefaq-PP 132kV Single Circuit Out
- Exhibit 3.2: RYK-PP to Feroza 132kV Single Circuit Out
- Exhibit 3.3: Mubarakpur to Ahmadpur,East 132kV Single Circuit Out
- Exhibit 3.4: Bhawalpur New-II to Mubarakpur 132kV Single Circuit Out
- Exhibit 3.5: Feroza to Khanpur 132kV Single Circuit Out
- Exhibit 3.6: Feroza to RYK-New 132kV Single Circuit Out
- Exhibit 3.7: RYK-New to Khanpur 132kV 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 even in the up-coming years i.e. 2021.

5.4 Conclusion of Load Flow Analysis

From the analysis discussed above, we conclude that the proposed interconnection scheme of looping in-out the Feroza - Ahmedpur-East 132 kV single circuit at RYK-PP is adequate to evacuate the 22.8 MW spillover power of RYK-Energy-PP under normal and contingency conditions.

It was found that in 2018 all the contingency cases the surrounding circuits remain within the rated capacity. Also the bus bar voltages were well within the permissible limits in all the contingency events.

The scenario of January 2018 and September 2021 was also evaluated and found to be stable under normal and contingency cases.



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 years 2018 and 2021 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 Chapter.2 of this report.

6.2 Fault Current Calculations without RYK-Energy-PP – Year 2018

In order to assess the short circuit strength of the network of 132 kV without RYK-Energy-PP for MEPCO in the vicinity of the site of the Plant near Ahmedpur-East and Feroza, fault currents have been calculated for balanced three-phase and unbalanced single-phase short circuit conditions in the year 2018. These levels will give us the idea of the fault levels without RYK-Energy-PP and later on how much the contribution of fault current from RYK-Energy-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 and are shown plotted in the Exhibit 4.0 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 RYK Energy Ltd. PP

Substation	3-Phase fault current, kA	1-Phase fault current, kA
RYK-PP-I 11Kv	24.78	17.49
RYK-PP 132kV	5.21	4.72
Ahmdpr.E 132kV	4.12	4.97
Feroza 132kV	9.55	9.15
RYK-New 132kV	16.38	16.12
Khanpur 132kV	9.91	10.68
R.Y. Khan 132kV	9.60	10.18
Mubarakpur 132kV	4.58	5.06
Bhawalpur New-II 132kV	8.17	8.47

6.3 Fault Current Calculations with RYK-Energy-PP interconnected– Year 2018

Fault currents have been calculated for the electrical interconnection of proposed scheme. Fault types applied are three phase and single-phase at the 132 kV bus bar of RYK-Energy-PP itself and other bus bars of the 132 kV substations in the electrical vicinity of RYK-Energy-PP. The graphic results are shown in Exhibit 4.1.

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 RYK-Energy-PP and the 132 kV bus bars of RYK-Energy-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 RYK Energy Ltd. PP

Substation	3-Phase fault current, kA	1-Phase fault current, kA
RYK-PP-II 11kV	25.02	25.73
RYK-PP-I 11Kv	25.06	17.57
RYK-PP 132kV	5.74	5.65
Ahmdpr.E 132kV	4.21	5.06
Feroza 132kV	9.87	9.44
RYK-New 132kV	16.66	16.32
Khanpur 132kV	10.05	10.79
R.Y. Khan 132kV	9.66	10.23
Mubarakpur 132kV	4.65	5.12
Bhawalpur New-II 132kV	8.24	8.51

6.4 Fault Current Calculations with RYK-Energy-PP interconnected– Year 2021

Fault currents have been calculated with RYK-Energy Ltd. PP connected as per the proposed interconnection scheme of looping in-out the Feroza to Ahmedpur East 132 kV Single Circuit at RYK-Energy Ltd. PP. Fault currents have been evaluated for the peak case of 2021 in order to observe the maximum fault current on RYK-Energy Ltd. PP and the bus bars in the vicinity of RYK-PP after its interconnection with the MEPCO/NTDC network. Fault types applied are three phase and single-phase at 132 kV bus bars of RYK-Energy-PP itself and other bus bars of the 132 kV substations in the electrical vicinity of Ahmedpur-East. The graphic results showing maximum 3-phase and 1-phase fault levels are indicated in Exhibit 4.2. Both 3-phase and 1-phase fault currents are indicated in the Exhibit 4.2 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 RYK-Energy-PP are placed in Appendix-D. Brief summary of fault currents at significant bus bars of our interest are tabulated in Table 6.3



Table-6.3
Maximum Short Circuit Levels with RYK Energy Ltd. PP

Substation	3-Phase fault current, kA	1-Phase fault current, kA
RYK-PP-II 11kV	25.06	25.7
RYK-PP-I 11Kv	24.90	17.38
RYK-PP 132kV	6.10	5.97
Ahmdpr.E 132kV	4.69	5.62
Feroza 132kV	10.30	9.74
RYK-New 132kV	17.37	16.86
Khanpur 132kV	10.48	11.07
R.Y. Khan 132kV	9.87	10.43
Mubarakpur 132kV	5.08	5.50
Bhawalpur New-II 132kV	8.93	9.21

Comparison of Tables 6.1, 6.2 and 6.3 shows an increase in short circuit levels for three-phase and single-phase faults due to connection of RYK-Energy-PP on the 132 kV bus bars in its vicinity; and a rise on Ahmedpur-East 132 kV bus bars because of direct connection with RYK-Energy-PP. We find that even after some increase, these fault levels are much below the rated short circuit values of the equipment installed on these substations.

For RYK-Energy Ltd. PP 132 kV, it would be advisable to go for standard size switchgear of short circuit rating of 40 kA. It would provide large margin for any future increase in short circuit levels due to future generation additions and network reinforcements in this area.

6.5 Conclusion of Short Circuit Analysis

The short circuit analysis results show that for the proposed scheme of interconnection of RYK-Energy-PP with Ahmedpur-East 132 kV Substation, we don't find any problem of violations of short circuit ratings of the already installed equipment on the 132 kV equipment of substations in the vicinity of RYK-Energy-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 RYK-Energy-PP 11 kV is 25.06 kA and 25.7 kA for 3-phase and 1-phase faults respectively in the year 2021. Therefore industry standard switchgear of the short circuit rating of 40 kA would serve the purpose, and can be installed at 132 kV switchyard of RYK-Energy-PP as per NTDC requirement taking care of any future generation additions and system reinforcements in its electrical vicinity.



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 Chapter.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	IEEE1
Speed Governing System	TGOV1
Inertia Constant	H = 2.642 MW-sec/MVA

7.1.2 System Conditions

Month of September 2018 has been selected for the study because it represents the peak load season after the COD of RYK Energy Ltd. Power Plant and thus the loading on the lines in the vicinity of RYK-Energy-PP will be maximum allowing us to judge the full impact of the plant.

The proposed scheme of looping in-out the single circuit of the Feroza to Ahmedpur-East 132 kV at RYK-Energy-PP has been modeled in the dynamic simulation.

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

7.1.3 Presentation of Results

The plotted results of the simulations 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 2-3 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 RYK-Energy-PP i.e. right at the 132 kV bus bar of RYK-Energy-PP substation, cleared in 5 cycles, as normal clearing time for 132 kV i.e. 100 ms, followed by a permanent trip of a 132 kV single circuit emanating from this substation. Also to fulfil the Grid Code criteria the extreme worst case of stuck breaker (breaker failure) has also been studied for single phase fault where the fault clearing time is assumed 9 cycles i.e. 180 ms.

7.2 Dynamic Stability Simulations' Results with RYK-Energy-PP interconnected - September 2018

7.2.1 Fault at 132 kV RYK-PP

We applied three-phase fault on RYK-PP 132 kV bus bar, cleared fault in 5 cycles (100 ms) followed by trip of a 132 kV single circuit between RYK-PP and Ahmedpur-East 132 kV substation. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 1.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ahmedpur-East, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 1.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 1.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output. However MVAR output acquires equilibrium at a slightly different value.



Fig. 1.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and settle to a new equilibrium.

Fig. 1.5 MW Flow on RYK-PP to Feroza 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from RYK-PP to Ahmedpur-East causes the entire output of RYK-PP to flow on the intact 132 kV circuit between RYK-PP and Feroza 132kV circuit. This causes significant loading on the RYK-PP to Feroza 132 kV circuit. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 1.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Kapco 132 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.2.2 Fault at 132kV RYK-PP (Stuck Breaker)

We applied single-phase fault on RYK-PP 132 kV bus bar, cleared fault in 9 cycles (180 ms), to simulate a stuck breaker case, followed by trip of a 132 kV single circuit between RYK-PP and Ahmedpur-East 132 kV substation. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 2.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ahmedpur-East, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.



Fig. 2.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 2.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 2.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 2.5 MW Flow on RYK-PP to Feroza 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from RYK-PP to Ahmedpur-East causes the entire output of RYK-PP to flow on the intact 132 kV circuit between RYK-PP and Feroza 132kV circuit. This causes significant loading on the RYK-PP to Feroza 132 kV circuit. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 2.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Kapco 132 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.2.3 Fault at Feroza 132 kV (Far-End Fault)

We applied three-phase fault on far 132 kV bus bar of Feroza to study the impact of a disturbance in the grid on the performance of the plant. The fault is cleared in 5 cycles (100 ms), followed by trip of 132 kV single circuit between Feroza and Khanpur. We



monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 3.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ahmedpur-East, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 3.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 3.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 3.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 3.5 MW Flow on RYK-PP to Feroza 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from Feroza to Khanpur, we have monitored the flow from RYK-PP to Feroza. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 3.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Kapco 132 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly



the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.2.4 Fault at Ahmed Pur East 132 kV (Far-End Fault)

We applied three-phase fault on far 132 kV bus bar of Ahmed pur East to study the impact of a disturbance in the grid on the performance of the plant. The fault is cleared in 5 cycles (100 ms), followed by trip of 132 kV single circuit between Ahmed pur East and Mubarakpur. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 4.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ahmedpur-East, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 4.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 4.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 4.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 4.5 MW Flow on RYK-PP to Ahmed pur East 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from Ahmed pur east to Mubarakpur, we have monitored the flow from RYK-PP to Ahmed pur east. We plotted the flows of MW and MVAR on this intact circuit and see that the power



flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 4.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Kapco 132 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.3 Dynamic Stability Simulations' Results with RYK-Energy-PP interconnected - September 2021

7.3.1 Fault at 132 kV RYK-PP

We applied three-phase fault on RYK-PP 132 kV bus bar, cleared fault in 5 cycles (100 ms) followed by trip of a 132 kV single circuit between RYK-PP and Feroza 132 kV substation. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 1.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ittefaq-PP, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 1.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 1.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output. However MVAR output acquires equilibrium at a slightly different value.



Fig. 1.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and settle to a new equilibrium.

Fig. 1.5 MW Flow on RYK-PP to Ittefaq-PP 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from RYK-PP to Feroza causes the entire output of RYK-PP to flow on the intact 132 kV circuit between RYK-PP and Ittefaq 132kV circuit. This causes significant loading on the RYK-PP to Ittefaq 132 kV circuit. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 1.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Ittefaq 11 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.3.2 Fault at 132kV RYK-PP (Stuck Breaker)

We applied single-phase fault on RYK-PP 132 kV bus bar, cleared fault in 9 cycles (180 ms), to simulate a stuck breaker case, followed by trip of a 132 kV single circuit between RYK-PP and Feroza 132 kV substation. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 2.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ittefaq-PP, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 2.2 Frequency



We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 2.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 2.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 2.5 MW Flow on RYK-PP to Ittefaq-PP 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from RYK-PP to Feroza causes the entire output of RYK-PP to flow on the intact 132 kV circuit between RYK-PP and Ittefaq 132kV circuit. This causes significant loading on the RYK-PP to Ittefaq 132 kV circuit. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 2.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Ittefaq 11 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.3.3 Fault at Ittefaq-PP 132 kV (Far-End Fault)

We applied three-phase fault on far 132 kV bus bar of Ittefaq-PP to study the impact of a disturbance in the grid on the performance of the plant. The fault is cleared in 5 cycles (100 ms), followed by trip of 132 kV single circuit between RYK-PP and Ittefaq-PP. We monitored different quantities for one second pre-fault and nine cycles



after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 3.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ittefaq-PP, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 3.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 3.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 3.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 3.5 MW Flow on Ittefaq-PP to Ahmed pur East 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from RYK-PP to Ittefaq-PP, we have monitored the flow from Ittefaq-PP to Ahmed pur-East. We plotted the flows of MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 3.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Ittefaq 11 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the



rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.3.4 Fault at Feroza 132 kV (Far-End Fault)

We applied three-phase fault on far 132 kV bus bar of Feroza to study the impact of a disturbance in the grid on the performance of the plant. The fault is cleared in 5 cycles (100 ms), followed by trip of 132 kV single circuit between Feroza and RYK-PP. We monitored different quantities for one second pre-fault and nine cycles after clearance of fault (post-fault) conditions and plotted the results attached in Appendix – E and discussed as follows:

Fig. 4.1 Bus Voltages

The bus voltages of 132 kV bus bars of RYK-PP, Ittefaq-PP, Feroza and Khanpur alongwith 11 kV bus bars of RYK-PP-I and RYK-PP-II are plotted. The results show quick recovery of the voltages after clearing of fault.

Fig. 4.2 Frequency

We see the system frequency recovers back to normal quickly after fault clearance.

Fig. 4.3 MW/MVAR Output of Generators of RYK-PP-II

The MW/MVAR output of RYK-PP-II gets back to the pre-fault output quickly after fast damping of the oscillations in its output.

Fig. 4.4 Speed and mechanical power of Generators at RYK-PP-II

The speed deviation of the generator, after clearing fault, damps down quickly returning to normal speed. The transients in mechanical power also damp quickly and attain equilibrium.

Fig. 4.5 MW Flow on Khanpur to Feroza 132 kV circuit

Followed by clearing of fault, the trip of a 132 kV single circuit from Feroza to RYK-PP, we have monitored the flow from Khanpur to Feroza. We plotted the flows of



MW and MVAR on this intact circuit and see that the power flows on this circuit attains to steady state level with power swings damping down fast.

Fig. 4.6 Rotor Angles

The rotor angles of the generators of RYK-PP-I 11 kV, RYK-PP-II 11 kV, Hamza-Power 11 kV, Etihad-Power 11 kV, Ittefaq 11 kV and Guddu New 500 kV are plotted relative to machines at Guddu New 500 kV. The results show that the rotor angle of RYK-PP-II gets back after the first swing and damps down quickly. Similarly the rotor angles of other machines swing little after the fault and damp fast after clearing of fault. The system is strongly stable and very strong in damping the post fault oscillations.

7.4 Conclusion of Dynamic Stability Analysis

The results of dynamic stability carried out for September 2018 and future scenario September 2021 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 RYK Energy Ltd. PP under all events of disturbances. Therefore there is no problem of dynamic stability for interconnection of RYK Energy Ltd. PP; it fulfills all the criteria of dynamic stability.



8.CONCLUSIONS

- ❖ The study objective, approach and methodology have been described and the plant's data received from the Client is validated.
- ❖ The nearest interconnection facility is the 132 kV substations of Khanbela and Feroza. The 132 kV single circuit line from Feroza to Ahmedpur-East lies at about 20 km from the site of RYK Energy Ltd.
- ❖ Due to the location of RYK Energy Ltd., the most feasible interconnection scheme would be looping in-out the existing 132 kV circuit between Feroza to Ahmedpur-East at RYK-Energy Ltd. PP, as had been done for RYK Mills Ltd. The upcoming chapters discuss in detail the location and interconnection of the new unit. A few approximate sketches are shown in Appendix-B.
- ❖ The two breaker bays of 132 kV at RYK-Energy Ltd. PP to connect with the 132 kV circuits each from Feroza and Ahmedpur East respectively are already installed for RYK Mills Ltd.
- ❖ In view of planned COD, of the RYK-Energy Limited in April 2018, the above proposed interconnection scheme has been assessed for steady state conditions through detailed load flow studies, short circuit analysis and stability criterion for the maximum load in the system i.e. September 2018.
- ❖ Steady state analysis by load flows, short circuit and stability criterion reveals that proposed scheme is adequate to export 22.8 MW output of the plant under normal and contingency conditions.
- ❖ Load flow analysis has also been carried out for the crushing month of January 2019 with the maximum thermal dispatch in the system.
- ❖ In an extended term scenario, September 2021 has been studied to evaluate the performance of the proposed interconnection scheme. The system conditions of normal and N-1 contingency have been examined for all scenarios to meet the reliability criteria. Along with it, short circuit and dynamic stability analysis have been carried out for a complete check of the system.
- ❖ The short circuit analysis carried out to calculate maximum fault levels at RYK-Energy Limited and the substations of 132kV in its vicinity reveals currents for the proposed scheme are much less than 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 RYK-Energy Limited.

- ❖ The dynamic stability analysis of proposed scheme of interconnection has been carried out. The stability has been tested for the worst cases, i.e. three phase fault right on the 132 kV bus bar of RYK-Energy Limited substation followed by the final trip of 132 kV circuits emanating from this substation has been performed for fault clearing of 5 cycles (100 ms), as understood to be the normal fault clearing time of 132 kV protection system. Also the extreme worst case of stuck breaker (breaker failure) has been studied where the fault clearing time is assumed 9 cycles i.e. 180 ms has been analysed for single phase fault. The stability of system for far end faults of 3-phase occurring at Feroza 132 kV and Ahmed Pur East 132 kV bus bars has also been checked.

