

The Registrar
Oil and Gas Regulatory Authority
54B, Fazal-e-Haq Road
Islamabad

18th May 2020

Subject: Application for a licence for construction and operation of a transmission pipeline

Dear Sir

K-Electric Ltd has commenced construction of a further power station in its Bin Qasim Power Complex in Karachi to serve the electricity needs of Karachi and adjoining areas. To fuel the same, in accordance with the decision of the Cabinet Committee of Energy (letter from the Ministry addressed to PLL is attached), RLNG will be purchased from Pakistan LNG Ltd ("PLL"). Currently PLL delivers RLNG to SSGC at a Custody Transfer Station in the area of the Bin Qasim port via a FOTCO pipeline. K-Electric will take delivery of allocated gas at prior to transfer to SSGC.

K-Electric is to lay a 14-inch diameter transmission line from one of two alternative tie-in points to its facility. An overview of the proposed project is attached.

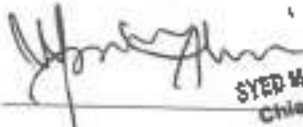
To obtain the licence required for such pipeline, we are pleased to enclose an Application in the form specified in Schedule I under the NGRA (Licensing) Rules, 2002, along with the documents specified in sub-rules 4(3) and (4) thereof and demand draft for Rs. 750,000 as the required fee.

We request OGRA to process our Application for the said Transmission Licence, to be exclusively for self-use (having no annual turnover).

Your early review would be highly appreciated as obtaining the requested licence is an important part to bringing the power station into operation.

We are available to provide additional information or clarification, if required.

Yours faithfully,


SYED MOONIS ABDULLAH ALVI
Chief Executive Officer
K-ELECTRIC LIMITED
Syed. Moonis Abdullah Alvi
CEO


Muhammad Aamir Ghaziani
Chief Financial Officer
K-ELECTRIC LIMITED
Muhammad Aamir Ghaziani
CFO

Jan 12:30 PM
on 28/5/20

SBD (LW)
ED (F/S) 46
ED (LW) - LA
2/5

- Enclosures:
- Overview
 - Ministry letter to PLL
 - Demand draft
 - Application
 - Index of required documents
 - Required documents



Received 2:50 PM
Register of the
28/5/20

DAD
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28/5/20

Pipeline Application by K-Electric Limited

OVERVIEW

K-Electric Limited (KE) has the sole responsibility of providing electric power services in the metropolitan city of Karachi and its adjoining areas. In pursuit of its vision and continuing commitment to the people of Karachi and its adjoining areas, KE has commenced construction of its highly efficient power generation plant based on state-of-the-art technology, named as BQPS-III (900MW CCPP). The project has been approved by NEPRA and also modification in KE's Generation License has been granted by NEPRA to include BQPS III project in KE's generation fleet. This project is essential to bridge the rising gap in power demand and supply in Karachi City & adjoining areas in Sindh and Baluchistan being served by KE. This project will help optimize the fuel mix, improve generation efficiency, reliability and reduce reliance on old thermal based generation and IPPs which will ultimately benefit the electricity consumers.

The BQPS-III project is comprised of 2x450MW F-Class Combined Cycle machines including enhancement of transmission system for reliable transformation of power to the grids and to the distribution system. Since the plant shall be replacing inefficient units in KE Fleet, it shall not only enable KE to meet the growing electricity demand of the Karachi city, the industrial hub of Pakistan, but shall also contribute significantly for generating electricity with economies of scale.

Cabinet Committee of Energy (CCOE) has approved allocation of 150 MMCFD RLNG to be supplied to KE by Pakistan LNG Limited (PLL). PLL will supply this RLNG to KE using the Gasport terminal facility. The strategic location of the project, in close proximity of Custody Transfer Station (CTS), allows KE to off-take RLNG at the doorstep of Bin Qasim Power Complex by installing a short Spur Pipeline from either the CTS (about 2km) or, even closer, at a point upstream of the CTS by tying-in to the Main Pipeline, being operated by FOTCO.

The proposed pipeline is necessary for connecting the 900 MW RLNG plant with RLNG supply source and is an integral part of RLNG supply scheme to BQPS III plant which is aimed at bridging the power shortfall and providing smooth and reliable supply of power to consumers. The BQPS-III power plant is being constructed in the most expeditious manner by commissioning the first unit in summer of 2021 followed by another unit's commissioning in the same year i.e. prior to December 31, 2021.

In order to efficiently operate the plant, supply of RLNG at high pressures is considered in the design which shall optimize the machine utilization by eliminating the need of installation of compressors, which otherwise is not possible in case of natural gas pipeline. For the sake of simple operation at the RLNG Supplier's end, KE has encompassed RLNG off-take at 85 barg pressure, same as to that of being delivered at CTS. Gas Pressure Reduction System (GPRS) shall be installed by EPC Contractor for BQPS-III including check metering, heaters, pressure

reduction skid etc. within the KE premises for meeting the fuel inlet requirements of Gas Turbines.

As per CCOE decision dated 27th March, 2020, KE has been given the responsibility to establish the pipeline arrangement at its own cost. Accordingly, KE engaged a reputable Engineering firm M/s Zishan Engineers, which has completed the Basic Design of Spur Pipeline, from CTS to KE's Bin Qasim Power Complex. The tendering process for an EPC contractor is underway.

The Spur Pipeline project (for which this application is being made) shall include construction of 14NPS pipeline, capable to handle RLNG supply up to 250 MMSCFD RLNG at 85 bar pressure from a Supply Point located at the RLNG CTS (Point A, in the attached map) to the Bin Qasim Power Complex. KE in collaboration PLL (RLNG Supplier) and FOTCO are also evaluating the option for interconnecting the Spur Pipeline from a tee-off point available in main send out pipeline (from Gasport to the CTS) and is situated at a closer proximity, opposite to the KE's Bin Qasim Power Complex (Point B, in the attached map). This option shall enable KE to further expedite the construction and commissioning of the project by reducing the span of required Right-of-Way for the proposed pipeline and eliminate the system modifications (if any) at the CTS.

The benefits associated with the proposed pipelines are below:

- Govt RLNG supply will be supplied to BQPS III power plant, which will reduce burden caused by "take or pay" nature of LNG contracts by coping up with under-utilization of Gasport terminal and sale of RLNG.
- The proposed pipeline will lead to operation of BQPS III power plant which will add 900 MW in KE system to meet the growing electricity demand of the city and bridge the demand-supply gap. Additionally, the proposed pipeline will resultantly improve the quality of service through reduced power outages, enhanced KE's power network and system reliability etc.
- Improve the flexibility of KE in operation at BQPS Complex by having different fuel mix options.
- Free-up pipeline capacity in the SSGC and SNGPL system for future RLNG demand and offset demand for domestic gas which may be used for other purposes.

The successful commercial operation of the pipeline project shall enable KE to operate its highly efficient plant with RLNG on OGRA's notified rates to produce electrical power economically which shall ultimately benefit the inhabitants of the Karachi area and help enhance the overall GDP of the country. Additionally, this project will facilitate Government in resolving the RLNG utilization issue thus releasing burden of huge expenditure on the RLNG handling.

Map attached with Overview of KE's Pipeline Application



No.NG(II)-16(4)/19-RLNG-Misc-Vol-V-Pt
Government of Pakistan
Ministry of Energy (Petroleum Division)
Directorate General Gas
First Floor, Petroleum House, G-5/2

Islamabad, the 30th April, 2020

The Managing Director,
Pakistan LNG Limited,
Islamabad.

Subject: **APPROVAL OF NATIONAL ELECTRIC POWER REGULATORY AUTHORITY IN THE MATTER OF APPLICATION OF DATANG PAKISTAN KARACHI POWER GENERATION (PVT.) LIMITED (DPKPG) FOR UNCONDITIONAL ACCEPTANCE OF UPFRONT COAL TARIFF FOR 2X360 MW COAL POWER PLANT AT PORT QASIM, SINDH (CASE NO.NEpra/TRF-364-DPKPG-2016)**

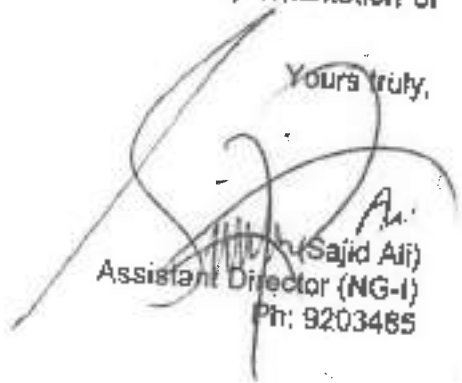
Dear sir,

I am directed to inform that the Cabinet Committee on Energy (CCoE) in its meeting held on 27.03.2020 vide Case No CCE-3/2/2020 dated 27.03.2020 while considering a summary submitted by the Power Division on the above subject and approved the proposals as contained in para-10 (iii) & (iv) of the summary. Para-10 (iv) of the summary is reproduced below as:

iv. Allocation and firm supply of 150 MMCFD RLNG or as per the requirement shared by KE, through PLTL / PLL, effective from January 2021 to December 2025 at OGRA notified rates.

2. It is requested to take further necessary action in the implementation of above CCoE decision at the earliest.

Yours truly,



(Sajid Ali)
Assistant Director (NG-I)
Ph: 9203485

Copy to:

- i) PA to DG (Gas), Petroleum Division, Islamabad.

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OIL AND GAS REGULATORY AUTHORITY

Application Form


Ref. No. _____

Date: 18th May 2020

Company Profile

1. Name of the Company (Applicant): K-Electric Limited
2. Company's full address along with telephone, fax, e-mail and web details:
KE House
39-B, Sunset Boulevard
Phase-II, DHA, Karachi

Tel: 021-3263 7133, 021-3870 9132
Email: aamir.rizwan@ke.com.pk
Web details: <https://www.ke.com.pk/>
3. Name, title and authorized signature of the Company's Chief Executive: Mr. Syed Moonis Abdulhah Alvi
Chief Executive Officer

Signature: 
4. Names and addresses of current Directors of the Applicant: See Annex A
5. Name and address of any person or corporate body with a holding of more than one percent (1%) or more in the Applicant: See Annex B



Applicant: K-Electric Limited

Licence Specifications

- 1. Regulated Activity for which a licence is sought:
 - (a) Transmission Licence Yes
 - (b) Distribution Licence _____
 - (c) Sale Licence _____
 - (d) Integrated Licence _____
 - (e) Project Licence _____

- 2. Nature of licence applied for (if exclusive, please provide detailed justifications): **Exclusive**

Justification for an exclusive licence is that the intended pipeline would be dedicated for gas to the Applicant. It is to be a short spur line from a main transmission line and only viable for delivery of gas to the Applicant.

- 3. Period for which the licence is sought: **From: 01 / 08 / 2020**
To: 31 / 07 / 2050

- 4. Details of any licence held, applied for, or applied for and refused under the Rules, by the Applicant, or any of the interested parties, or any of their affiliated or related undertakings: **None.**



List of documents enclosed with K-Electric Ltd's Pipeline Application

Rule	Description	Remarks
✓ 4(2)	Names and addresses of current Directors of the Applicant.	Annex A
✓ 4(3)	Name and address of any person or corporate body with a holding of 1% or more in the Applicant.	Annex B
✓ 4(3)(a)	Attested copies of the memorandum and articles of association of the Applicant.	Annex C
✓ 4(3)(b)	Attested copy of the Applicant's certificate of commencement of business.	Annex D
✓ 4(3)(c)	Attested copy of the latest yearly submission to the Registrar of Companies.	Annex E
✓ 4(3)(d)	Attested copy of the latest audited annual and unaudited half yearly financial statements of the Applicant.	Annex F 2019 Annual Report separately attached as it is a bound booklet. Half yearly financial statement to end 2019 to be provided when prepared.
✓ 4(3)(e)	Attested copy of the corporate authorizations allowing the submission of the application.	Annex G
4(3)(f)	In the case of an applicant being a subsidiary company, the documents specified in clauses (d) to (d) of this sub-rule, pertaining to its holding company.	Annex H Note – holding company is registered in the Cayman Islands where no annual return or accounts are required to be filed. 2x
4(3)(g)	Details of the consents required under applicable laws, from persons other than the Authority, for carrying on the relevant regulated activities and the status of such consents.	Right-of-Way (ROW) from the Port Qasim Authority (PQA); Chief Inspector of Explosives (CIE), and environmental approval from the EPA/SEPA; the status of each and any other will be provided as the process progresses.
4(3)(h)	Details of the technical and financial expertise and resources available for carrying on the relevant regulated activities.	Annex I
4(3)(i)	Details of the resources and expertise available to handle emergency situations arising out of natural calamities, accidental or criminal acts or omissions, specifying which such resources are available and which are to be procured.	Annex J
4(3)(j)	A list of the names and business addresses of the Applicant's senior management, including without limitation, departmental and/or divisional heads.	Annex K

4(3)(k)	If the Applicant or any of its officers or directors, directly or indirectly, owns, controls, or holds ten percent or more of the voting interest in any other person engaged in the production, transmission, distribution, or sale of natural gas, or in any person engaged in the financing, construction, maintenance or operation of such facilities, a detailed explanation of each such relationship, including the percentage of voting interest owned, held or controlled.	Whilst not strictly applicable, in the interest of full disclosure, it may be mentioned that a non-executive director of the Applicant, Dr. Ahmed Mujtaba Memon (GoP nominee), is also a director of SSGC.
4(3)(l)	A list of all other applications, petitions or filings filed by the applicant which are pending before the Authority at the time of the filing of this application and which directly and significantly affect this application, including an explanation of any material effect the grant or denial of those other applications, petitions or filings will have on this application and of any material effect the grant or denial of this application will have on those other applications, petitions or filings.	None
4(3)(m)	<p>Details of the following market data:</p> <p>(i) an estimate of the volume of natural gas to be transmitted, distributed or sold;</p> <p>(ii) number and consumption details of consumers;</p> <p>(iii) the applicant's total annual peak day natural gas requirement;</p> <p>(iv) total past (if applicable) and expected curtailments of service by the applicant.</p>	<p>(i) Transmission of 150MMCFD with future provision of additional 100MMCFD for Bin Qasim Power Complex;</p> <p>(ii) Self consumption at Bin Qasim Power Complex;</p> <p>(iii) 150MMCFD with future provision of additional 100MMCFD;</p> <p>(iv) Not Applicable</p>
4(3)(n)	Such other information or documentation as the Authority may, from time to time, require, including without limitation, supplementary information or documentation required by the Authority to clarify the information contained in the application.	Details will be provided, as required.
4(4)(a)	Maps issued or certified by the Survey of Pakistan, drawn to an appropriate scale showing details of areas where the transmission facilities are or are proposed to be located and the principal geographical features of the said areas, including without limitation, details of mountains, rivers, streams, roads, buildings or construction habitation.	Annex L, including original large-size Survey of Pakistan map in plastic sleeve.
4(4)(b)	Details of the sources and quality of supply of natural gas including forecasts of the available quantity from such sources.	Pakistan (NG) Ltd. (PL) shall supply 150MMCFD ALNG @ 15 barg with specifications range as Annex M.



4(4)(c)	Details of how the Applicant proposes to meet the safety and service obligations by the Authority.	The Applicant has a stringent HSEQ policy (see Annex N). Furthermore, the EPC Contractor will supplement the existing Policy to ensure the safety and service obligations of the Authority are maintained.
4(4)(d)	Details of capacity and estimated throughput, of the transmission facilities, per annum for ten years following the proposed grant of the licence.	250MMCFD (Capacity), including 100MMCFD capacity, kept as future provision. 91,250 MMCF (estimated throughput per year, including 36,500 MMCF per annum throughput as future provision).
4(4)(e)	Technical specifications of the transmission facilities (existing and proposed), including without limitation, specifications for the design construction, operation and maintenance of the facilities.	Annex Q

K-Electric Board of Directors

S. No.	Name	Position	Address
1	Reyadh S.A.A Edrees	Chairman	Mubarak Al Abdulla, Block-2, Street 209, House 41, P.O. Box 417, Post Code 13005, Kuwait
2	Syed Moonis Abdullah Alvi	Chief Executive Officer	House No.13, Park Lane-1, Street-17, Khayaban-e-Salier Phase-6, DHA, Karachi
3	Adeeb Ahmad	Non-Executive Director	H. No.23-B, 3rd Giza Street, Phase-4, DHA, Karachi
4	Chaudhary Khagan Saadullah Khan	Non-Executive Director	House No 75/1, Street 11, Khayaban-e-Radar, DHA Phase 6, Karachi
5	Dr. Ahmed Mejtaba Merion	Non-Executive Director	H. No. D-150/2, Block-2, Clifton, Karachi
6	Ianil Akbar	Non-Executive Director	42/1, 23rd Street, Off Khayaban-e-Murahid, DHA-5, Karachi
7	Khalid Rafi	Independent Director	8-C, Khayaban-e-Shujaan Ph-V, DHA, Karachi
8	Mubasher H. Sheikh	Non-Executive Director	House BR-640/P, Eidgah Scheme, Rawalpindi
9	Muhammad Abic Lakhari	Non-Executive Director	H. No 34, Main Khayaban-e-Ittehad, Phase-VI, DHA, Karachi.
10	Ruhail Muhammad	Non-Executive Director	House No 101/1, Khayaban-e-Badban, Phase-V, Karachi
11	Shao A. Ashary	Non-Executive Director	PO Box 54308, Riyadh 11514, Saudi Arabia
12	Syed Asad Ali Shah Jilani	Non-Executive Director	H.No 70/1, Street No.3, Off Khayaban-e-Badr, Phase-6, DHA, Karachi
13	Wasim Mukhtar	Non-Executive Director	Flat No 14-B, 48-Family SITE, G-5, Islamabad



**CATEGORIES OF SHAREHOLDERS
AS ON December 31, 2019
ORDINARY SHARES**

Categories of Shareholders	Total		
	Number	Shares	%age
Associated companies, undertakings and related parties			
AND / OR			
Shareholders holding five percent or more voting rights in the Company			
KES Power limited (Holding Company)	1	18,335,542,678	66.40
President of the Islamic Republic of Pakistan (GOP)	1	6,726,912,278	24.36
Mutual Funds			
CDC - TRUSTEE PICIC INVESTMENT FUND	1	4,130,500	0.01
CDC - TRUSTEE PICIC GROWTH FUND	1	5,875,500	0.02
CDC - TRUSTEE ATLAS STOCK MARKET FUND	1	6,750,000	0.02
CDC - TRUSTEE MEEZAN BALANCED FUND	1	18,742,000	0.07
CDC - TRUSTEE FAYSAL STOCK FUND	1	200,000	0.00
CDC - TRUSTEE ALFALAH GHP VALUE FUND	1	502,500	0.00
CDC - TRUSTEE AKD INDEX TRACKER FUND	1	650,648	0.00
CDC - TRUSTEE HDL ENERGY FUND	1	8,013,000	0.03
CDC - TRUSTEE AKD OPPORTUNITY FUND	1	25,000,000	0.09
CDC - TRUSTEE AL MEEZAN MUTUAL FUND	1	31,747,500	0.11
CDC - TRUSTEE MEEZAN ISLAMIC FUND	1	188,293,000	0.68
CDC - TRUSTEE UBL STOCK ADVANTAGE FUND	1	4,400,484	0.02
CDC - TRUSTEE ATLAS ISLAMIC STOCK FUND	1	3,200,000	0.01
CDC - TRUSTEE AL-AMEEN SHARAH STOCK FUND	1	8,000,673	0.03
CDC - TRUSTEE NBP STOCK FUND	1	10,164,000	0.04
CDC - TRUSTEE NBP BALANCED FUND	1	355,000	0.00
CDC - TRUSTEE ASKARI ASSET ALLOCATION FUND	1	509,500	0.00
CDC - TRUSTEE MEEZAN TAHAFUZZ PENSION FUND - EQUITY SUB FUND	1	26,995,500	0.10
CDC - TRUSTEE APF-EQUITY SUB FUND	1	350,000	0.00
CDC - TRUSTEE ALFALAH GHP ISLAMIC STOCK FUND	1	5,093,000	0.02
CDC - TRUSTEE HBL - STOCK FUND	1	6,343,000	0.02
CDC - TRUSTEE NBP ISLAMIC SARMAVA IZAFI FUND	1	2,753,500	0.01
CDC - TRUSTEE APF - EQUITY SUB FUND	1	1,005,000	0.00
CDC - TRUSTEE HBL MULTI - ASSET FUND	1	186,000	0.00
CDC - TRUSTEE ALFALAH GHP STOCK FUND	1	1,315,000	0.00
CDC - TRUSTEE ALFALAH GHP ALPHA FUND	1	903,000	0.00
CDC - TRUSTEE ABL STOCK FUND	1	8,000,000	0.03
CDC - TRUSTEE FIRST HABIB STOCK FUND	1	100,000	0.00
CDC - TRUSTEE NBP SARMAVA IZAFI FUND	1	625,000	0.00
CDC - TRUSTEE NBP MAHANA AMQANI FUND - MT	1	391,500	0.00
CDC-TRUSTEE HBL ISLAMIC STOCK FUND	1	3,320,000	0.01
CDC - TRUSTEE HBL EQUITY FUND	1	780,500	0.00
CDC - TRUSTEE HDL MF EQUITY SUB FUND	1	823,500	0.00
CDC - TRUSTEE HBL MF EQUITY SUB FUND	1	805,000	0.00
CDC - TRUSTEE KSE MEEZAN INDEX FUND	1	6,807,040	0.02
MCBFSL - TRUSTEE PAK OMAN ADVANTAGE ASSET ALLOCATION FUND	1	505,000	0.00
MCBFSL - TRUSTEE PAK OMAN ISLAMIC ASSET ALLOCATION FUND	1	1,086,000	0.00



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MOHAMMAD RIZWAN DALLA
Company Secretary
K-10, BCTREC LIMITED

CDC-TRUSTEE FIRST HABIB ISLAMIC STOCK FUND	1	200,000	0.00
MCBPSL - TRUSTEE ABL ISLAMIC STOCK FUND	1	4,000,000	0.01
CDC - TRUSTEE AL-AMEEN ISLAMIC ASSET ALLOCATION FUND	1	907,126	0.00
CDC - TRUSTEE FAYSAL SAVINGS GROWTH FUND - MT	1	2,000	0.00
CDC-TRUSTEE AL-AMEEN ISLAMIC RET. SAV. FUND-EQUITY SUB FUND	1	1,560,000	0.01
CDC - TRUSTEE UBL RETIREMENT SAVINGS FUND - EQUITY SUB FUND	1	837,500	0.00
CDC - TRUSTEE NATIONAL INVESTMENT (UNIT) TRUST	1	4,673,775	0.02
CDC - TRUSTEE HBL ISLAMIC EQUITY FUND	1	2,502,500	0.01
CDC - TRUSTEE ABL ISLAMIC PENSION FUND - EQUITY SUB FUND	1	345,000	0.00
CDC - TRUSTEE ABL PENSION FUND - EQUITY SUB FUND	1	120,000	0.00
CDC - TRUSTEE NBP ISLAMIC STOCK FUND	1	3,133,000	0.01
CDC - TRUSTEE NBP INCOME OPPORTUNITY FUND - MT	1	1,408,500	0.01
CDC - TRUSTEE NBP SAVINGS FUND - MT	1	381,000	0.00
CDC - TRUSTEE FAYSAL ISLAMIC ASSET ALLOCATION FUND	1	200,000	0.00
CDC - TRUSTEE AL AMEEN ISLAMIC DEDICATED EQUITY FUND	1	2,111,330	0.01
CDC - TRUSTEE NBP ISLAMIC ACTIVE ALLOCATION EQUITY FUND	1	901,500	0.00
CDC - TRUSTEE HBL ISLAMIC ASSET ALLOCATION FUND	1	656,500	0.00
CDC - TRUSTEE FAYSAL MTS FUND - MT	1	12,446,000	0.05
CDC - TRUSTEE MEEZAN ASSET ALLOCATION FUND	1	11,225,000	0.04
CDC - TRUSTEE NBP ISLAMIC ENERGY FUND	1	3,320,500	0.01
CDC - TRUSTEE MEEZAN ENERGY FUND	1	6,341,000	0.02
MCBPSL TRUSTEE ABL ISLAMIC DEDICATED STOCK FUND	1	1,061,500	0.00
CDC - TRUSTEE UBL INCOME OPPORTUNITY FUND - MT	1	40,000	0.00
CDC - TRUSTEE AGPF EQUITY SUB-FUND	1	40,000	0.00
CDC - TRUSTEE AGPF EQUITY SUB-FUND	1	33,000	0.00
CDC - TRUSTEE UBL CAPITAL PROTECTED FUND III	1	100,000	0.00
CDC - TRUSTEE ALFALAH GMP ISLAMIC DEDICATED EQUITY FUND	1	412,000	0.00
CDC TRUSTEE - MEEZAN DEDICATED EQUITY FUND	1	7,754,500	0.03
CDC - TRUSTEE ALFALAH GMP ISLAMIC VALUE FUND	1	137,000	0.00
MCBPSL - TRUSTEE AKD ISLAMIC STOCK FUND	1	743,000	0.00
CDC - TRUSTEE ALFALAH CAPITAL PRESERVATION FUND II	1	506,500	0.00
CDC - TRUSTEE AL-AMEEN ISLAMIC ENERGY FUND	1	855,434	0.00
MCBPSL-TRUSTEE ABL ISLAMIC ASSET ALLOCATION FUND	1	300,000	0.00
CDC - TRUSTEE HBL DEDICATED EQUITY FUND	1	8,953	0.00
MCBPSL - TRUSTEE HBL ISLAMIC DEDICATED EQUITY FUND	1	530,000	0.00
CDC - TRUSTEE ALLIED FINERGY FUND	1	800,000	0.00
CDC - TRUSTEE ATLAS ISLAMIC DEDICATED STOCK FUND	1	528,500	0.00
CDC - TRUSTEE GOLDEN ARROW STOCK FUND	1	12,600,000	0.05
Directors, CEO & their Spouses and Minor Children	1	500	0.00
Executives	3	30,100	0.00
Public Sector Companies and Corporations	15	55,777,112	0.20
Banks, Development Finance Institutions, Non-banking Finance Companies, Insurance Companies, Takaful, Mudarabah and Venture Funds			
Banks, Financial Institutions	30	252,856,543	0.92
Investment Companies	5	26,917	0.00
Insurance Companies	20	20,348,240	0.07
Joint Stock Companies	232	410,010,975	1.48
Mudarabah Management Companies	3	23,301	0.00



[Handwritten Signature]

MUHAMMAD AZHARUDDIN
Company Secretary
K-ELECTRIC LIMITED

Modarabas	24	2,899,835	0.01
Charitable Trusts	17	972,015	0.00
Leasing Companies	-	-	-
General Public - Local	24,197	1,243,965,138	6.50
Foreign Shareholders	88	73,168,759	0.26
Others	52	24,618,651	0.09
	24,754	27,615,094,246	100.00

[Handwritten Signature]



MUHAMMAD ROZMAN ENAM
 Company Secretary
 K-ELECTRIC LIMITED

46



Karachi Electric Supply Company Ltd.
 formerly: **Karachi Electric Supply Corporation Ltd.**
 2nd Floor, Handicraft Bldg., Abdulla Haroon Road, Saddar, Karachi-74400

**CERTIFIED TRUE COPY OF THE SPECIAL RESOLUTIONS
 PASSED AT THE EXTRA-ORDINARY GENERAL MEETING OF
 THE MEMBERS OF THE COMPANY HELD ON 22 JANUARY 1999**

"RESOLVED that the authorized capital of the company be and is, hereby, increased from Rs.2,500,000,000 (Rupees Two Billion Five Hundred Million) to Rs.10,000,000,000 (Rupees Ten Billion)."

"FURTHER RESOLVED that Clause V of the Memorandum of Association of the company be and is, hereby, substituted with the following: -

"The share capital of the company is Rs.10,000,000,000 (Rupees Ten Billion) divided into 1,000,000,000 ordinary shares of Rs.10/- each."

"FURTHER RESOLVED that Article No.6 of the KESC Articles of Association be and is, hereby, substituted with the following: -

"The authorized capital of the Company is Rs.10,000,000,000 (Rupees Ten Billion) divided into 1,000,000,000 ordinary shares of Rs.10/- each."

"RESOLVED that the conversion of Government of Pakistan interest bearing loans of Rs.3,045,123 Billion into equity and the issue of further capital to that extent without making a rights issue be and is, hereby, approved subject to the approval of the Federal Government / Corporate Law Authority as required u/s 86 of the Companies Ordinance 1984."

"FURTHER RESOLVED that the Directors of the Company be and are, hereby, authorized to take all necessary steps in this regard, approve the terms (other than as specified herein) of and effect issuance of 512,300 ordinary shares of Rs.10/- each fully paid up at par in full & final settlement of G.O.P. loans of Rs.3,045,123,000 (Rupees Three Billion Forty-Five Million One Hundred Twenty Three Thousand only) subject to completion of all legal requirements envisaged under Companies Ordinance 1984 and KESC Memorandum & Articles of Association. The above shares will rank pari passu in every respect with the existing capital of the company."



TRUE COPY
 VERIFIED BY
 Director/Secretary
 Karachi Electric Supply Corp



Handwritten signature
 Corporate Secretary
 Karachi Electric Supply Corp

receipt or other act for conformity, or for any loss or expense happening to Company through the insufficiency or deficiency of title to any property acquired by order of the Directors, Chief Executive, Chairman, or other officer for or on behalf of the Company, or for the insufficiency or deficiency of any security in or upon which any of the moneys of the Company shall be invested, or for any loss or damage arising from the bankruptcy, insolvency or tortious act of any person with whom any money, securities or effect shall be deposited, or for any loss occasioned by any error of judgment or oversight on his part, or for any other loss, damage or misfortune whatever which shall happen in the execution of duties of his office or in relation thereto, unless the same happens through his own willful act, default or dishonesty.

WE, the several persons whose names and addresses are subscribed, are desirous of being formed 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.

Dated this Sixth Day of September, 1913

Name of Subscriber	Address and Description of Subscriber	Number of Ordinary Shares taken by each Subscriber	Witness to Signature
T.L.F. Beaumont	Merchant, Karachi	1 (one)	
Ghulamali G. Chagla	Merchant, Karachi	1 (one)	
Nadirshaw E. Dinshaw	Merchant, Karachi	1 (one)	
W.U. Nicholas	Merchant, Karachi	1 (one)	
B. Frank Jones	Merchant, Karachi	1 (one)	
Chellaram Dullposmal	Merchant, Karachi	1 (one)	
Abdul Rahim Saleh Mahmood	Merchant, Karachi	1 (one)	

Certified to be true copy
 Deputy Registrar of Companies
 17/9/13



would be entitled to receive notice of the meeting, and (c) to the auditors of the Company for the time being.

**NO SHAREHOLDERS TO ENTER THE
PREMISES OF THE COMPANY WITHOUT PERMISSION**

102. No Member or other person (not being a Director) shall be entitled to enter the property of the Company, or to inspect or examine the Company's premises or properties of the Company, without permission of the Board or the Chairman, or Chief Executive, and to require disclosure of any information respecting any details 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 to/of the conduct of the business of the Company and which in the opinion of the Board or the Chief Executive will be inexpedient in the interest of the Members to communicate.

SECRECY

103. Every Director, Chief Executive, Chairman, Manager, Auditor, Trustee, Member of Committee, Officer, Servant, Agent, Accountant, or other person employed in the business of the Company shall, if so required by the Board before entering upon his duties, sign a declaration in the form approved by the Board pledging himself to observe strict secrecy representing all transactions of the Company with the customers and the state of accounts with individuals and in matters relating thereto, and shall by 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 so to do by the Board, or by any Annual General Meeting, or by a court of law, and except so far as may be necessary in order to comply with any provisions in these presents contained.

**WINDING UP
DISTRIBUTIONS OF ASSETS ON WINDING UP**

- 104(i) If the Company shall be wound up, (whether voluntarily or otherwise) the liquidators may, with the sanction of a Special Resolution and any other sanction required by the Ordinance, divide amongst the Members in specie at kind, the whole or any part of the assets of the Company, whether they consist of property of same kind or not.
- (ii) For purpose aforesaid, the liquidator may set such value as he deems fair upon any property to be divided as aforesaid and may determine how such division shall be carried out as between the Members or different classes of Members.
- (iii) The liquidator may, with the like sanction, vest the whole or any part of such assets in Trustees upon such trust for the benefit of the contributories as the liquidator, with the like sanction, thinks fit but so that no Member shall be compelled to accept any shares or other securities whereon there is any liability.

INDEMNITY

105. Every Director, Chief Executive, Chairman, Manager or Officer of the Company or any person (whether an officer of the Company or not) employed by the Company as Auditor or Adviser, shall be indemnified out of the funds of the Company against any liability incurred by him as such Director, Chief Executive, Chairman, Manager, Officer, Auditor, or Adviser in defending any proceedings, whether civil or criminal, in which judgment is given in connection with any application under Section 498 of the Ordinance in which relief is granted to him by Court.

INDIVIDUAL RESPONSIBILITY OF DIRECTORS

106. No Director, Chief Executive, Chairman, or other officer of the Company will be liable for the acts, receipts, neglects or defaults of any other Director or Officer or for joining any

and profit and loss accounts, auditors' report and directors' report (annual audited accounts) to its members through CD/DVD/USB at their registered addresses. However, if a member prefers to receive hard copies for all the future annual audited accounts then such preference of the member shall be given to the Company in writing and thereafter the Company shall provide hard copies of all the future annual audited accounts to such member.

AUDIT
APPOINTMENT OF AUDITORS AND THEIR DUTIES

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

NOTICES
HOW NOTICE TO BE SERVED ON MEMBERS

- 96. A notice may be given by the Company to any Member or Director 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 or outside Pakistan supplied by him to the Company for the giving of notice to him. A notice may be given by telex or facsimile transmission.

SERVICE BY POST

- 97. 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.

NOTICE TO MEMBERS ABROAD BY ADVERTISING IN NEWSPAPERS

- 98. If a Member or Director has no registered address in Pakistan and has not supplied to the Company an address within or outside Pakistan for the giving of notices to him, a notice addressed to him or to the shareholders generally and advertised in a newspaper circulating in the Province in which the Office is situated shall be deemed to be duly given to him on the day on which the advertisement appears.

NOTICE TO JOINT HOLDER

- 99. A notice shall be deemed to be given by the Company to the joint-holder of a share by giving the notice to the joint-holder named first in the Register in respect of the share.

NOTICE TO PERSONS ENTITLED BY TRANSMISSION

- 100. 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 or representatives of the deceased, or assignee of the insolvent, or by any like description, at the address if any in Pakistan supplied for the purpose by the persons claiming to be so entitled, or (until) such an address has been so supplied by giving the notice in any manner in which the same have been given if the death or insolvency had not occurred.



[Handwritten Signature]

FORWARDED BY MAIL
Company Secretary
M-ELECTRIC LIMITED

NOTICE OF GENERAL MEETING

- 101. Notice of every General Meeting shall be given in same manner herein before authorized to (a) every Member of the Company except those Member who, having no registered address within Pakistan, have not supplied to the Company an address within or outside Pakistan 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 Member, who but for his death or insolvency

become entitled thereto as capital. All or any part of such capitalized fund may be applied on behalf of such shareholders for payment in full or in part either at par or at such premium as the resolution may provide, for any un-issued shares or Debentures of the Company which shall be distributed accordingly, and such distribution or payment shall be accepted by such shareholders in full satisfaction of their interest in the said capitalized sum.

ACCOUNTS
BOOKS OF ACCOUNT TO BE KEPT

89. The Board shall cause to be kept proper books of account as required under the Ordinance.

WHERE BOOKS TO BE KEPT

90. The books of account shall be kept at the office or at such other place as the Board shall think fit and shall be opened to inspection by Directors during business hours.

INSPECTION BY MEMBERS

91. The Board shall from time to time determine whether and to what extent and at what time and places and under what conditions or regulations the accounts and books or papers of the Company or any of them shall be opened to inspection of the Members, and no Member (not being a Director) shall have any right of inspecting any account and books or papers of the Company except as conferred by law or authorized by the Board or by Special Resolution.

PROFIT AND LOSS ACCOUNT AND BALANCE SHEET

92. Within eighteen months of the incorporation of the Company, and subsequently once at least in every calendar year, the Directors shall cause to be prepared and lay before the Company in General Meeting a balance sheet and profit and loss account, both made up in accordance with Ordinance and to a date not more than four months before the date of the Meeting for the period, in the case of first balance sheet and profit and loss account, since incorporation of the Company, and in case of any subsequent balance sheet and profit and loss account, since the preceding account. Every such balance sheet shall be accompanied by an Auditor's report and the Directors' report in accordance with the provisions of the Ordinance in that behalf.

COMPLIANCE WITH ORDINANCE

93. The Directors shall in all respects comply with Sections 230 to 236 in regard to accounts of the Company.

**COPIES OF DIRECTORS' REPORT AND
BALANCE SHEET TO BE SENT TO MEMBERS**

94. A copy of the Balance Sheet and Profit and Loss Account together with a copy of the Auditor's Report and Directors' Report shall be sent to all Members along with the notice convening the Annual General Meeting before which same are required to be laid at least twenty-one days preceding the meeting.
- 94-A: The Company may, with prior consent of the member(s), circulate notices of general meetings and annual balance sheet and profit and loss account, auditors' report and directors' report (annual audited accounts) to its member(s) through email. Further, the Company may, with consent of the members obtained in general meeting in accordance with the provisions of SECP's SRD No.470(1)/2016 dated 31 May 2016 and subject to compliance with the conditions specified therein, and any other conditions / instructions as notified by SECP from time to time in this respect, circulate the annual balance sheet


MEHREZ RIZWAN DULLA
Company Secretary
ELECTRIC LAMPED

share is issued on the terms that it shall rank for Dividend as from a particular date, such share shall rank for Dividend accordingly.

DIVIDENDS HOW PAID

- 82a. Every Dividend after it is declared shall be paid by crossed cheques or Dividend warrants to be delivered or sent by post to, and at the sole risk of the Members entitled thereto, at the registered addresses of the Members or their agents as provided in Section 250 of the Ordinance and the Company shall not be liable for any loss sustained by a Member by reason of any forged endorsement of any cheque or warrant or the fraudulent recovery by any other person.

POWER OF BOARD TO CREATE RESERVE

83. The Board may before recommending any Dividend, set aside out of the profits of the Company such sum as it thinks proper as a reserve or reserves, which shall, at the discretion of the Board, 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, in the like discretion, either be employed in the business of the Company or be invested in such investments, (other than shares of the Company), as the Board may from time to time think fit.

RECEIPTS FOR DIVIDENDS BY JOINT HOLDERS

84. If several persons are registered as joint holders of any share, any one of them may give effectual receipts for any Dividends payable on the share.

NO INTEREST ON DIVIDENDS

85. No Dividends shall bear interest against the Company. The Dividends shall be paid within the period laid down in the Ordinance.

PAYMENT BY POST


- 86(a) Any Dividend may be paid by Cheque or warrant sent through the post at the registered address of the Member or person entitled thereto, or in the case of joint holders to any one of such joint holders at his registered address, or to such person and at such address as the Member or person entitled or such joint holders, as the case may be, may direct. Every such cheque or warrant shall be made payable to the order of the person to whom it is sent, or to the order of such other person as the Member or person entitled or such joint holders, as the case may be, may direct.
- (b) Unclaimed Dividends may be invested or otherwise used by Board for the benefit of the Company until claimed.

CARRYING FORWARD OF PROFITS

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

CAPITALISATION CAPITALISATION OF RESERVES

88. Any General Meeting may, upon recommendation of the Board, by ordinary resolution resolve that any undistributed profits of the Company (including profits carried and standing to the credit of any reserve or reserves or other special accounts or representing premiums received on the issue of shares and standing to the Credit of the share premium account and capital reserve arising from realized or unrealized appreciation of the assets or goodwill of the Company or from any acquisition/sale of interests in other undertakings) be capitalized. Such capital undistributed profits and reserve shall be distributed amongst such of the shareholders as would be entitled to receive the same if distributed by way of Dividend, and in the same proportions, on the footing that they


MR. PRASAD KUMAR SALLA
Company Secretary
K-TELECOM LIMITED

remove a Chief Executive before the expiration of his term of office notwithstanding any thing contained in these Articles or in any agreement between the Company and the Chief Executive.

- (vi) The terms and conditions of appointment of the Chief Executive shall be determined by the Board which shall also determine his remuneration.

POWERS OF CHIEF EXECUTIVE

77. The Chief Executive shall have overall authority over and responsibility for the management of the affairs of the Company and the conduct, and the custody and maintenance of its properties, assets, records and accounts in accordance with the policies and guidelines established by the Board.

In addition, the Board may entrust to and confer upon Chief Executive any of the powers exercisable by the Board other than the powers which are required to be compulsorily exercised under the Ordinance by the Board at its meeting upon such terms and conditions and with such restrictions as it may think fit, and may from time to time revoke, withdraw, alter, vary all or any of such powers.

THE SEAL CUSTODY OF SEAL

78. The Board shall provide a Common Seal for the purposes of the Company and for the safe custody of the Seal, and the Seal shall never be used except by the authority of the Board or a Committee of Directors previously given, and one Director at least shall sign (in the same manner as provided for in Article 14) on every instrument to which the Seal is affixed; provided nevertheless, that any instruments bearing the Seal of the Company and issued for valuable consideration shall be binding on the Company notwithstanding any irregularity touching any authority to make the same. The Board shall also have power to destroy the Seal and substitute a new Seal thereof, if necessary.

DIVIDENDS AND RESERVES DECLARATION OF DIVIDENDS AND RESTRICTION OF AMOUNT THEREOF

79. The Company in General Meeting may declare Dividends, but no Dividends shall exceed the amount recommended by the Board.

INTERIM DIVIDEND

80. The Board may from time to time pay to the Members such Interim Dividends as appear to be justified by the profit of the Company.

DIVIDEND OUT OF PROFITS ONLY

81. No Dividends shall be paid otherwise than out of profits of the year, or any other undistributed profits of prior years.

DECLARATION OF DIVIDENDS IN SPECIE

- 81a. Any declaration of a Dividend may state that such Dividend shall be paid wholly or in part by the distribution of specific assets and in particular of paid up shares, Debentures or debenture stock of the Company or paid up shares, debenture stock of any other Company, or in any one or more of such ways.

DISTRIBUTION OF DIVIDENDS

82. Subject to the rights of any persons entitled to shares with special rights as to Dividends, the profits distributed as Dividends shall be distributed among the shareholders and all Dividends shall be declared and paid according to the amounts paid on the shares. If any

fifteen minutes of the time fixed for the meeting choose one of their Members to be chairman of such meeting.

**WHEN ACTS OF DIRECTORS OR COMMITTEE
VALID NOTWITHSTANDING DEFECTIVE APPOINTMENT**

72. All acts by any meeting of the Board or of a committee of Directors, or by any person acting as Director or Alternate Director shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of any such Directors or persons acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such Director or person had been duly appointed and was qualified to act. Provided that as soon as any such defect has come to notice, the Director or other person concerned shall not exercise the right of this office till the defect has been rectified.

RESOLUTION BY CIRCULATION

73. Except for the matters as are required by Section 196 of the Ordinance to be decided at a meeting of the Board, a resolution in writing signed by majority of the Directors shall be effective as if such resolution had been passed at a meeting of the Directors.

COMMITTEE OF DIRECTORS


74. The Board may from time to time delegate all, or any of their powers not required to be exercised at a meeting of the Board, to a committee or committees consisting of two or more Directors as the Board thinks fit. Any committee so formed shall conform to any regulations that may be imposed upon it by the Board and shall be governed, in the exercise of the powers so delegated, by the provisions herein contained for regulating meetings and proceedings applicable to the Directors.

**CHAIRMAN AND CHIEF EXECUTIVE
APPOINTMENT OF CHAIRMAN**

75. Upon the first appointment, and thereafter upon each election of Directors, the Directors shall (i) appoint as the Chairman of the Board of Directors and (ii) determine the period for which he is to hold office.

APPOINTMENT OF CHIEF EXECUTIVE

- 76(a) The Board shall within fifteen days of the incorporation of the Company appoint an individual (including a Director) as the Chief Executive of the Company designated as the Chief Executive. The first Chief Executive shall hold office until the first Annual General Meeting of the Company (unless he earlier resigns or otherwise ceases to hold office) or until the expiry of a shorter period if the Board had fixed a shorter period for this appointment. If the Chief Executive ceases to hold office before the first Annual General Meeting, the Board shall fill the vacancy within fourteen days, but the person appointed to fill the vacancy shall hold office only till the first Annual General Meeting.
- (i) Within fourteen (14) days from the date of an election of Directors under Article 36 or within fourteen (14) days from the date on which office of the Chief Executive falls vacant for whatsoever reason, the Board shall appoint any person (including an elected Director) to be the Chief Executive of the Company, but such appointment shall not be for a period exceeding three (3) years from the date of appointment.
- (ii) Upon the expiry of an appointment under clauses (i) and (ii) above a Chief Executive shall be eligible for re-appointment.
- (iv) The Chief Executive shall, if he is not already a Director of the Company, be deemed to be its Director and be entitled to all the rights and privileges, and subject to all liabilities of the office of Director of the Company.
- (v) The Directors of the Company by a resolution passed by not less than three-fourth of the total number of Directors for the time being, or the Company by Special Resolution, may


MUHAMMAD RIZWAN DATTA
 Company Secretary
 K-ELECTRIC LMT

RETIRING DIRECTOR SHALL BE ELIGIBLE FOR RE-ELECTION

- 67a. A retiring Director shall be eligible for re-election. The retiring Directors shall continue to perform their functions until their successors are elected in the manner prescribed by these Articles and the Ordinance.

ALTERNATE DIRECTOR POWER TO APPOINT ALTERNATE DIRECTOR

68. Any Director not permanently resident in Pakistan or any Director so resident but intending to be absent from Pakistan for a period of not less than three months may appoint any person acceptable to the Board to be an Alternate Director of the company to act for him. Every such appointment shall be in writing under the hand of the Director making the appointment. An Alternate Director so appointed shall not be entitled to appoint any other Director, but shall otherwise be subject to provisions of the Articles with regards to Directors, except that he need not be a Member nor shall he require any share qualification. An Alternate Director shall be entitled to receive notices of all meetings of the Board, and to attend and vote as a Director at any such meeting at which the Director appointing him is not personally present, and generally to perform all the functions of his appointer as Director in the absence of such appointer. An Alternate Director shall ipso facto cease to be an Alternate Director if his appointer for any reason ceases to be a Director or if and when his appointer comes or returns to Pakistan, or if the appointee is removed from office by notice in writing under the hand of the appointer.

The appointment of an alternate Director will constitute leave of absence from the Board for the Director for whom such alternate is appointed during such Director's absence.

PROCEEDINGS OF DIRECTORS MEETING OF DIRECTORS

69. The Directors may meet together for the dispatch of business, adjourn, and otherwise regulate meetings of the Board as they think fit. A Resolution moved at any meetings of Directors shall be passed by a majority vote. The Chief Executive or the Secretary may at any time and shall on the written requisition of two Directors at any time, summon a meeting of the Board, unless otherwise decided by the Board, at least seven clear days notice must be given to all Directors to summon a meeting of the Board, and such notice shall set forth the purpose or purposes for which such meeting is summoned. With the consent of all the Directors entitled to receive notice of meeting, or to attend or vote at, any such meeting of the Board may be convened by shorter notice than specified in this Article.

Any Director may waive notice of the time, place and purpose of any meeting of directors either before, at or after such meeting.

- 69-A. The meetings of the Board of Directors and Committees of Directors in emergent situations may be held through tele / video conferencing pursuant to such conditions and guidelines specified by SECP from time to time.

- 69-B. The Directors shall meet together at least once in every quarter of every financial year.

QUORUM OF DIRECTOR'S MEETING AND POWERS

70. A meeting of the Board for the time being at which a quorum is present shall be competent to exercise all or any of the authorities, powers and discretion by or under the Article vested in or exercisable by the Board generally. Six Directors or 1/3rd of their number whichever is greater, for the time being personally present shall constitute a quorum, subject to the provisions of the Ordinance. For the purpose of calculating one-third any fraction shall be ignored.

CHAIRMAN

71. The Chairman shall, whenever present, act as Chairman at each meeting of the Board, but if at any meeting the chairman is present and not willing to act or is absent beyond ten minutes after the time fixed for holding the same, the Directors present shall within

- (a) a person representing the Government or an institution or authority which is a Member;
 - (b) a whole-time Director who is an employee of the company;
 - (c) a Chief Executive; or
 - (d) A person representing a creditor.
- (B) he absents himself from three consecutive meetings of the Directors or from all the meetings of the Directors for a continuous period of three months, whichever is the longer, without leave of absence from the Directors;
- (C) he or any firm of which he is a partner or any private company of which he is a Director:
- (i) without the sanction of the Company in General Meeting accepts or holds any office of profit under the Company other than of Chief Executive or a legal or technical adviser or a banker, or
 - (ii) accepts a loan or guarantee from the company in contravention of Section 195 (if applicable in terms of that Section);
- (D) he resigns his office by notice in writing to the company;
- (E) he, being a Director who is an employee of the Company, ceases to be an employee of the Company for whatsoever reason.
- (F) he does not hold or ceases to hold the share qualification, if any necessary for his appointment.

POWERS OF DIRECTORS


65. The control of the Company shall be vested in the Board and the business of the Company shall be managed by the Board, which may pay all expenses incurred in forming and registering the Company, and may exercise all such powers of the Company as are not by the Ordinance or by these Articles required to be exercised by the Company in General Meeting subject nevertheless to the regulations of these Articles to the provisions of the Ordinance and such regulations, (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 Board which would have been valid if the regulation had not been made.

POWER TO OBTAIN FINANCES AND ISSUING SECURITIES

66. The Board may exercise all the powers of the Company to borrow and mortgage or charge its undertaking, property and assets, (both present and future), and to issue Debentures and other securities, whether outright or as collateral security for any debt, liability or obligation of the Company, or of any third party.

DIRECTORS TO COMPLY WITH THE ORDINANCE

67. The Directors shall duly comply with the provisions of the Ordinance or any statutory modification thereof for the time being in force, and in particular with the provisions in regard to the registration of the particulars of mortgage 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, or sub-division of shares and copies of Special Resolutions and a copy of the Register of Directors and notification of any changes therein.


 MUZAMMIL RIZWAN DALIA
 Company Secretary
 K-ELECTRIC LIMITED

CASUAL VACANCY

60. The Directors may at any time appoint any person to be a Director to fill a casual vacancy in the Board. Any Director so appointed shall hold office for the remainder of the term of the Director in whose place he is appointed.

REMUNERATION OF DIRECTORS

61. Subject to the Ordinance, until otherwise determined by the Company in General Meeting every Director (including an alternate Director but excluding the Chief Executive and a full time Working Director) shall be entitled to be paid as remuneration for his services for Meetings of Board and Committees of Directors as may be prescribed by the Board and per meeting attended by him. Each Director (including each alternate Director), shall be entitled to be reimbursed his reasonable expenses incurred in consequence of his attendance at meetings of the Directors or of Committees of Directors.

EXTRA REMUNERATION MAY BE PAID TO DIRECTOR

62. 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 Board, are outside the scope of the statutory duties of a Director may be paid such extra remuneration as may be fixed by the Board.

SHARE QUALIFICATION OF DIRECTORS

63. Save and except that a Director must be a Member (unless he represents the Government, an institution (including a multi-national company) or an authority which is a member of the Company, or is a whole time working Director, or a Chief Executive or a person representing a creditor on the Board, such Director shall not require any share qualification, so long as only subscribers shares are in issue. Thereafter, the qualification of a Director shall be his holding shares in his own name of such value as may be prescribed by the Ordinance. In the case of Directors representing interest holding shares of requisite value, no such share qualification shall be required, provided intimation in writing as to such representation is lodged with the company forthwith upon appointment / election of a Director.

VACATION OF OFFICE OF DIRECTOR

64. The office of a Director shall ipso facto be vacated if:
- (A) he becomes ineligible to be appointed as a Director on any one or more of the grounds enumerated as follows, that is to say, he:
- (i) is a minor,
 - (ii) is or becomes of unsound mind
 - (iii) has applied to be adjudicated as an insolvent and his application is pending;
 - (iv) is an un-discharged insolvent;
 - (v) has been convicted by court of law for an offence involving moral turpitude;
 - (vi) has been debarred from holding such office under any provision of the Ordinance;
 - (vii) has betrayed lack of fiduciary behaviour and a declaration to this effect has been made by the Court under Section 217 at any time during the preceding five years;
 - (viii) is not a Member.

Provided that this clause (viii) shall not apply in the case of:

FIRST DIRECTORS

55. The first Directors shall be appointed by the subscribers to the Memorandum and shall stand retired from office at the first Annual General Meeting of the Company.

ELECTION OF DIRECTORS

- 56(i) After the first appointment of Directors, the number of elected Directors fixed by the Board under Article 54 shall be elected to office by the Members in General Meeting in the following manner, namely:-
- a Member 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;
 - 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;
 - 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 have been so elected;
- (ii) Where the number of candidates is equal to or less than number of Directors to be elected it will not be necessary to hold an election as laid down in clause (i) of this Article and all the candidates shall be deemed to have been elected under this Article.

TERM OF OFFICE

57. A Director elected under Article 56 shall hold office for a period of three years unless he earlier resigns, becomes disqualified from becoming Director or otherwise ceases to hold office. An election of Directors in the manner prescribed by the preceding Article shall be held once in every three years.

REMOVAL OF DIRECTORS

58. The Company may by resolution in General Meeting remove a Director appointed under Article 55 or 60 or elected or deemed to have been elected under Article 56.
- Provided that a resolution for removing a Director shall not be deemed to have been passed unless the number of votes cast in favour of such a resolution is not less than:
- (i) The minimum number of votes that were cast for the election of a Director at the immediately preceding election of Directors, if the resolution relates to removal of Director elected in the manner provided in Article 56; or
 - (ii) The total number of votes for the time being computed in the manner laid down in Article 56 divided by the number of Directors for the time being if the resolution relates to removal of a Director appointed under Article 55 or 60.

DISQUALIFICATION AS A DIRECTOR

- 58a. A person shall be disqualified for appointment as Director of the Company on any one or more of the grounds enumerated in Section 187 of the Ordinance.

CONTINUING DIRECTORS TO ACT

59. The continuing Directors may act notwithstanding any vacancy in their body, but if the minimum falls below the number fixed by Article 54 thereof, the Directors shall not, except for the purpose of filling a vacancy in their number or convening a General Meeting, act so long as the number remains below the minimum.

PROXY TO BE DEPOSITED AT THE OFFICE

49. No person shall act as Proxy unless the instrument of his appointment and the Power of Attorney, if any, under which it is signed, shall be deposited at the Office at least forty-eight hours before the time for holding the Meeting at which he proposed to vote.

FORM OF PROXY

50. An instrument appointing a Proxy may be in the following form or a form as near thereto as may be:

"I _____ of _____ in the district of _____ being a Member of the K-Electric Limited hereby appoint _____ of _____ as my Proxy to vote for me and on my behalf at the (annual, extraordinary, as the case may be) General Meeting of the company to be held on the _____ day of _____ and at any adjournment thereof".

- 50-A: "An instrument of proxy in relation to e-voting shall be in the following form or a form as near thereto as may be:

I/we _____ of _____ being a member of K-Electric Limited, holder of _____ ordinary share(s) as per registered Folio/Account No. _____ hereby opt for e-voting through intermediary and hereby consent the appointment of execution officer (Mr. _____) as my/our proxy and will exercise e-voting as per the Companies (E-voting) Regulations 2016 and hereby demand for poll for resolutions.

My secured email address is _____, please send login details, password and electronic signature through email."

VALIDITY OF PROXY

51. A vote given in accordance with the terms of an instrument of Proxy shall be valid notwithstanding the previous death of principal or revocation of the Proxy or of any power of attorney under which such Proxy was signed, provided that no intimation in writing of the death or revocation shall be received at the office of the Company before the Meeting or the adjourned Meeting at which Proxy is used.

VALIDITY OF VOTE

52. No objection shall be made to the validity of any vote except at the Meeting or at the poll at which such vote shall be tendered, and every vote whether given personally or by Proxy not disallowed at such Meeting or poll shall be deemed valid for all purposes of such meeting or poll.

CHAIRMAN TO DECIDE

53. If any question is raised, the Chairman of the Meeting shall decide on the validity of every vote tendered at such Meeting in accordance with these Articles.

DIRECTORS

54. The number of Directors shall not be less than seven (7) nor more than thirteen (13) elected Directors. The Board shall fix the number of elected Directors of the Company not later than thirty-five (35) days before the convening of the General Meeting at which Directors are to be elected and the number so fixed shall not be changed except with the prior approval of the General Meeting of the Company.

RIGHT TO VOTE OF JOINT HOLDERS

43. In case of joint-holders, the vote of the senior who tenders a vote, whether in person or by Proxy, shall be accepted to the exclusion of the votes of the other joint-holders; and for this purpose seniority shall be determined by the order in which the names stand in the Register.

REPRESENTATIVES OF CORPORATE MEMBERS

44. A company or other body corporate which is a Member of the Company may, by resolution of its Directors, or Proxy signed by authorized officers, authorize any of its officials or any other persons to act as its representative at any meeting of the Company and the person so authorized shall be entitled to exercise the same powers on behalf of the company which he represents as if he was an individual shareholder of the company.

VOTING BY MEMBER OF UNSOUND MIND

45. A Member of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy, may vote, whether on show of hand or on a poll, by his committee or other legal guardian, and any such committee or legal guardian may, on a poll, vote by Proxy.

POLL BY PROXY

46. On a poll, votes may be given either personally or by Proxy.

PROXY

47. Every Proxy shall be appointed in writing under the hand of the appointer or by an agent duly authorized under a Power of Attorney or if such appointer is a company or corporation under the Common Seal of the company or corporation or the hand of its Attorney who may be the appointer. A Proxy must be a Member. A Proxy shall have right as respects speaking and voting at a meeting as are available to a Member personally present at the Meeting. A Member shall not be entitled to appoint more than one Proxy to attend any one Meeting. If any Member appoints more than one Proxy for any one Meeting and more than one Instruments of Proxy are deposited with the Company, all such Instruments shall be rendered invalid.
- 47-A: "A member may opt for e-voting in a general meeting of the Company in accordance with the provisions and requirements under the Companies (E-Voting) Regulations 2016 notified by SECP on 22 January 2016 and any other provision, condition and requirement as notified by SECP from time to time in this respect, shall be deemed to be incorporated in these Articles of Association, irrespective of other provisions of these Articles of Association and notwithstanding anything contradictory therein. Members may appoint members as well as non-members as PROXIES for the purposes of e-voting to the extent permitted under the applicable laws."

IRREVOCABLE PROXY

48. A Proxy declared expressly on its face to be irrevocable shall not be revoked or be deemed revoked by the Member giving such Proxy without the consent of the Proxy-holder, whether by attendance at any General Meeting held during the period of such Proxy or by any other action on his part whatsoever or otherwise during the term of such Proxy if such Proxy is furnished to and filed with the records of the Company, and the Company shall be bound to recognize and give effect to such Proxy in accordance with terms thereof.



chairman of the Meeting, or by any Member or Members present in person or by Proxy and having not less than one-tenth of the total voting power in respect of the resolution or by any Member or Members present in person or by Proxy and holding shares in the company conferring a right to vote on the resolution being shares on which an aggregate sum has been paid up which is not less than one-tenth of the total sum paid up on all the shares conferring that right, and unless a poll is so demanded, a declaration by the Chairman that a resolution has been carried or carried unanimously or by particular majority or lost, and an entry to that effect in the books of the proceedings of the company shall be conclusive evidence of the fact without further proof of the number or proportion of the votes recorded in favour of or against such Resolution.

CASTING VOTE

- 36a. In the case of equality of votes whether on a show of hands or on a poll, the Chairman of the meeting at which the show of hands takes place or at which the poll is demanded, shall be entitled to a second or casting vote.

POLL

37. If a poll is demanded as aforesaid it shall be taken 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 the resolution passed at 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.

POLL ON ELECTION OF CHAIRMAN AND ADJOURNMENT

38. Any poll demanded on the election of a Chairman of Meeting or any question of adjournment shall be taken at the Meeting and without adjournment.

EFFECT OF POLL

39. The demand for a poll shall not prevent the continuation of a Meeting for the transaction of any business, other than the question on which the poll was demanded.

MINUTES

40. Minutes shall be made in books provided for the purpose of all resolutions and proceedings at General Meetings, and any such Minutes if signed by any person purporting to have been the Chairman of the Meeting or next following Meeting shall be conclusive evidence of the facts therein stated without further proof.

MINUTES BOOKS

41. The Books containing Minutes of Proceedings of General Meetings of the Company shall be kept at the Registered Office of the Company and during business hours (subject to reasonable restrictions as the Board may from time to time impose but so that not less than two hours each day is allowed for inspection) be open to the inspection of any Member without charge.

VOTES OF MEMBERS

42. Except as provided in Article 36 hereof, upon a show of hands every person entitled to vote and present in person or by Proxy shall have one vote, and upon a poll every Member entitled to vote and present in person or by Proxy shall have one vote for every share held by him.

place, the day and the hour of General Meeting and in case of special business, all material facts concerning such business, shall be given in a manner provided by the Ordinance for the General Meetings to such persons as are, under the Ordinance or the Articles, entitled to receive such notice from the Company.

SPECIAL BUSINESS

30. All business shall be deemed special that is transacted at an Extraordinary General Meeting, and also all that is transacted at an Annual General Meeting with the exception of declaring a dividend, the consideration of the accounts, balance sheet and the reports of Directors and Auditors, the election of Directors, the appointment of and the fixing of the remuneration of the Auditors. Where it is proposed to pass a Special Resolution at a General Meeting, notice of the Meeting shall specify the intention to propose the Resolution as a Special Resolution.

OMISSION TO GIVE NOTICE

31. In a case in which notice of any Meeting is given to the shareholders individually, the accidental omission to give notice to any of the shareholders or the accidental non-receipt thereof shall not invalidate the proceedings at any such Meeting.

PROCEEDINGS AT GENERAL MEETING QUORUM

32. Ten Members, present in person and representing not less than [twenty five (25%)] of the total voting power of the company either on their own account or as proxies shall be a quorum for a General Meeting. No business shall be transacted at any General Meeting unless the requisite quorum is present at the time when the Meeting proceeds to business.

CHAIRMAN OF GENERAL MEETING

33. The Chairman shall be entitled to take the chair at every General Meeting. If there is no Chairman or if at any Meeting he shall not be present within fifteen minutes after the time appointed for holding such Meeting or is unwilling to act, the Directors present may elect a Director as Chairman and if no Director present is willing to act as Chairman, the Members present shall choose one of the Members to be the Chairman.

ADJOURNMENT OF MEETING FOR LACK OF QUORUM


34. If within half an hour after the time appointed for the holding of a General Meeting a quorum is not present, the Meeting if convened on the requisition of the Members shall be dissolved, and in every other case shall stand adjourned to the same day in the week following at the same time and place or to such other day, time and place as the Board may by notice to share holders appoint. If at the adjourned meeting, a quorum is not present the Members present personally being not less than two shall be the quorum and may transact the business for which the meeting was called.

ADJOURNMENT BY CHAIRMAN

35. The Chairman with the consent of a General Meeting may adjourn any Meeting from time to time and from place to place, but no business shall be transacted at any adjourned Meeting other than business left unfinished at the Meeting from which the adjournment took place.

VOTING ON RESOLUTIONS BY SHOW OF HANDS AND WHEN POLL DEMANDED

36. 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 results of the show of hands) demanded by at least five Members present in person or by Proxy or by the


 MUHAMMAD REZHAN TALIA
 Company Secretary
 K-ELECTRIC LIMITED

CONDITIONS OF BONDS, ETC

23. Any bonds, debentures or other securities issued or to be issued by the Company shall be under the control of the Board which may issue them upon such terms and conditions and in such manner and for such consideration as shall be considered by the Board to be for the benefit of the company.

ISSUE AT DISCOUNT

24. Any bonds debentures or other securities may be issued at a discount premium or otherwise and with any special privileges as to redemption, surrender, drawings, convertibility into shares, attending and voting at General Meetings of the Company, appointment of Directors, and otherwise, provided that debentures with the right to be converted into shares shall not be issued without the consent of the Company in General Meeting.

INDEMNITY TO DIRECTORS

25. If Directors or any of them or any other person shall become personally liable for the payment of any sum primarily due from the company, the Board may execute or cause to be executed any mortgage, charge or security over or affecting the whole or any part of the assets of the Company by way of indemnity to secure the Directors or person so becoming liable aforesaid from any loss in respect of such liability.

GENERAL MEETINGS ANNUAL GENERAL MEETING

26. A General Meeting, to be called Annual General Meeting, shall be held, in accordance with the provisions of Section 158, within eighteen months from the date of Incorporation of the Company and thereafter once at least in every calendar year within a period of four months following the close of its financial year and not more than fifteen months after the holding of its last preceding Annual General Meeting as may be determined by the Board.
- 26.A: "The Company may provide video conference facility to its members for attending the general meetings at places other than the town where general meeting is convened subject to fulfilment of such conditions, consent and meeting the requirements relating to number of members and time limit as notified by SECP vide circular no.10 of 2014 dated 21 May 2014 and any other conditions / guidelines notified by SECP from time to time."

EXTRA-ORDINARY GENERAL MEETING

27. All General Meetings of the Company other than an Annual General Meeting shall be called Extraordinary General Meetings.

WHEN EXTRA-ORDINARY GENERAL MEETINGS TO BE CALLED OR REQUISITIONED

28. The Board may call an Extraordinary General Meeting whenever it shall deem fit. An Extraordinary General Meeting may also be called on the requisition of the Members in accordance with the provision of Section 159.

NOTICE OF MEETINGS

29. Twenty-one day's notice at the least (exclusive of the day on which the notice is served or deemed to be served, but inclusive of the day for which notice is given) specifying the

being registered as a Member in respect of the share, be entitled in respect of it to exercise any rights conferred by Membership in relation to meetings of the Company.

- (vi) The Company shall incur no liability or responsibility whatsoever in consequence of its registering or giving effect to any transfer of shares made or purporting to be made by any apparent legal owner thereof (as shown or appearing in the Register) to the person having or claiming any equitable right, title or interest to or in the same shares, notwithstanding that the Company may have had notice of such equitable right, title or interest or notice prohibiting registration of such transfer, and the Company shall not be bound or required to regard or attend or give effect to any notice which may be given to it of any equitable right, title or interest, or be under any liability whatsoever for refusing or neglecting so to do, but the Company shall nevertheless be at liberty to regard and attend to any such notice and give effect thereto, if the Board shall so think fit.

ALTERATION OF CAPITAL

- 20(i) The Company may from time to time by Special Resolution increase the authorized share capital by such sum to be divided into shares of such amount as the resolution shall prescribe.
- (ii) Except and so far as otherwise provided by the conditions of issue or by the Articles, any capital raised by the creation of new shares shall be considered part of the authorized capital and shall be subject to the provision herein contained with reference to transfer and transmission, voting and otherwise.
- (iii) The Company may by Special Resolution reduce its share capital in any manner and with and subject to any incident, authorization and consent required by law.
- (iv) The Company may in a General Meeting by Ordinary Resolution alter the conditions of its Memorandum as follows:
- Consolidate and divide all and any of its share capital into shares of larger amount than its existing shares.
 - Sub-divide shares or any of them into shares of smaller amounts than originally fixed by the Memorandum, subject nevertheless to the provisions of the Ordinance in that behalf.
 - Cancel shares which at the date of General Meeting have not been taken or agreed to be taken by any person and diminish the amount of its share capital by the amount of the shares so cancelled.

POWER TO BORROW POWER OF THE BOARD

21. The Board may from time to time borrow any moneys for the purpose of the Company from the Members or from any other persons, firms, companies, corporations, government agencies, institutions or banks, or the Directors may themselves lend moneys or provide finance to the company.

GIVING OF SECURITIES

22. The Board may borrow moneys and secure payment thereof in such manner and upon such terms and conditions in all respects as it may think fit, and in particular by the issue of bonds, debentures, or by mortgage or charge or other security on the whole or any part of the property, assets and rights of the Company, (both present and future), including its uncalled capital for the time being.

The Board may from time to time alter or vary the transfer form.

CONDITIONS FOR REGISTRATION OF TRANSFER

18. The Directors shall not refuse to register any transfer of fully paid shares unless the instrument of transfer is defective or invalid or is not accompanied by the Certificate of the shares to which it relates.

TRANSMISSION OF SHARES

- 19(i) Any Member may make and deposit with the company a nomination in writing specifying one or more eligible persons who or each of whom, in the event of the death of the Member, may be entered in the Register as the holder of such number of shares specified in the nomination for such nominee or each such nominee of which the Member remains the registered holder at the date of his death. A person shall be eligible for nomination for the purposes of this Article only if he is a spouse, parent, brother, sister or child of the Member nominating him and the applicable relationship shall be specified in the nomination in respect of each nominee. A Member may at any time by notice in writing cancel, or by making and depositing with the company another nomination before his death vary, any nomination already made by him pursuant to this Article. In the event of the death of a Member any person nominated by him in accordance with this Article may, on written application accompanied by the relative share certificate and evidence establishing the death of the Member, request the Company to register himself in place of this deceased Member as the holder of the number of shares for which the nomination in his favour had been made and deposited with the company, and if it shall appear to the Directors that it is proper so to do, the Directors may register the nominee as the holder of those shares in place of the deceased Member.
- (ii) In case of death of a Member who was a joint holder of shares, the survivor or survivors shall be the only persons recognized by the Company as having any title to his interest in the shares. If the deceased Member was a sole holder of shares, the nominee or nominees of the deceased where a nomination under Article 19(i) is effective, shall be the only person recognized by the Company as having any title to his interest in the shares. In case of such deceased Member who had not made a nomination under Article 19(i), the legal personal representative of such deceased Member where he was a sole holder shall be the only person recognized by the Company as having any title to his interest in the shares.
- (iii) Any person becoming entitled to a share in consequence of the death or insolvency of a Member may, upon such evidence being produced as may from time to time properly be required by the Directors and subject as hereinafter provided, elect either to be registered himself as the holder of the shares or instead of being registered himself, to make such transfer of the share as the deceased or insolvent person could have made, but the Directors shall, in either case, have the same right to decline or suspend registration as they would have had in the case of a transfer of the share by that Member before his death or insolvency as the case may be.
- (iv) If the person so becoming entitled shall elect to be registered himself, he shall deliver or send to the Company a notice in writing signed by him stating that he so elects. If he shall elect to have another person registered he shall testify his election by executing to that person a transfer of the share. All the limitations, restrictions and provisions of these Articles relating to the right to transfer and the registration of transfers of shares shall be applicable to any such notice or transfer as aforesaid as if the death or insolvency of the Member had not occurred and the notice or transfer were a transfer signed by that Member.
- (v) A person becoming entitled to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he was the registered holder of the share, except that he shall not before

**ISSUE OF NEW CERTIFICATE IN PLACE OF
DEFACED, LOST OR DESTROYED CERTIFICATE**

- 15. If any Certificate is worn-out, defaced or rendered useless, then upon production thereof to the Board, it may order the same to be cancelled and may issue a new Certificate in lieu thereof, and if any Certificate is lost or destroyed, then on proof thereof, to the satisfaction of the Board and on such indemnity as the Board deems adequate being given, a new Certificate in lieu thereof shall be given to the party entitled to such lost or destroyed Certificate. The new Certificate may be issued on such terms and fee as may be prescribed by the Board including payment of expenses incurred by the Company in investigating title.

TRANSFER OF SHARES

- 16. The instrument of transfer of any shares in the Company shall be executed both by the transferor and transferee, and the transferor shall be deemed to remain holder of the share until the name of the transferee is entered in the Register of Members in respect thereof. The Company shall keep a book to be called the "Register of Transfer" and therein shall be fairly and distinctly entered the particulars of every transfer or transmission of any share.

FORM OF TRANSFER

- 17. The instrument of transfer of any share shall be in writing in the usual common form or in the form appearing in the next paragraph or as near thereto as circumstances will admit.

K-Electric Limited

"I, _____ son/daughter/wife of _____ and of _____ being a _____ national, called the "Transferor" in consideration of the sum of Rs. _____ (Rupees _____) paid to me by _____ son/daughter/wife of _____ of _____ a national of _____ and Muslim/Non-Muslim (hereinafter called "The Transferee") do hereby transfer to the Transferee _____ share(s) numbered _____ in the undertaking called K-Electric Limited to hold the same unto the said Transferee, his (or her) executors, administrators and assigns subject to the several conditions on which I held the same immediately before the execution hereof, and I, the Transferee, do hereby agree to take the said share(s) subject to the conditions aforesaid. As witness our hands the day of _____

Witness _____ Signature: _____
Transferors

Signature _____ dated _____ Signature: _____
Transferee

Full Address: _____

Witness
Signature: _____

Full Name
Father's / Husband name



MUHAMMAD RIZWAN DURR
Company Secretary
K-ELECTRIC LIMITED

Full Address: _____

Nationality:
Occupation and Full Address
of Transferee

application of the purchase money nor shall his title to the shares be affected by any irregularity or invalidity in the proceedings in reference to the sale.

ISSUE OF FURTHER SHARES

10. Subject to Section 86, where at any time the Board decides to increase the issued capital of the Company by issuing any further shares, then subject to any direction to the contrary that may be given by the Company in General Meeting, such shares shall be offered to the Members in proportion to the existing shares held by each Member, and such offer shall be made by notice specifying the number of shares to which the Member is entitled and limiting a time within which the offer, if not accepted, will be deemed to be declined and after the expiration of such time, or on receipt of information from the Member to whom notice is given that he declines to accept the shares offered, the Board may dispose of the same in such manner as it may consider most beneficial to the Company.

The Company shall not give whether directly or indirectly, and whether by means of a loan, guarantee, provision of 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 any shares in the Company, nor shall the Company make a loan for any purpose whatsoever on the security of its shares, but nothing in the Articles shall prohibit any transaction which may be permitted by the Ordinance.

REGISTER OF MEMBERS

11. The Company shall cause to be kept a Register of Members and Index of Members in accordance with the provisions of Section 147 of the Ordinance.

EVIDENCE OF MEMBERSHIP

12. Any application for subscription signed by or on behalf of an applicant or subscriber for shares in the Company, followed by an allotment of any shares therein, shall be an acceptance of shares within the meaning of the Articles, and every person who thus or otherwise accepts any shares and whose name is entered on the Register shall for the purpose of the Articles be a Member.

TRUST NOT RECOGNISED

13. Save as here in otherwise provided, the Company shall be entitled to treat the person whose name appears on the Register as the holder of any shares as the absolute owner thereof, and accordingly shall not (except as ordered by a Court of competent jurisdiction or as by law required) be bound to recognize any trust or equity or benefit, equitable, contingent or other claim to or interest in such shares, on the part of any other person whether or not it shall have expressed or implied notice thereof.

CERTIFICATES

14. Every Member shall, on payment of such sum as the Directors may prescribe, be entitled to one certificate for all the shares registered in his name or upon paying such fee as the Board may from time to time determine, to several certificates each for one or more shares. Every certificate of shares shall specify the number and denote the number of shares in respect of which it is issued, and the amount paid thereon, such certificates shall be issued under Seal, and shall bear the signature of one Director and shall be countersigned by the Secretary or by a Second Director, or by some other person appointed for that purpose by the Board. The Directors may by resolution determine, either generally or in any particular case, that the signature of any Director (s) may be affixed by some mechanical means in the mode and manner specified in such resolution, provided that, in respect of a share or shares held jointly by several persons, the Company shall not be bound to issue more than one certificate, and delivery of a certificate for a share to one of several joint-holders shall be sufficient delivery to all.

SHARES

- 7(i) Subject to the conditions, here in contained the shares shall be under the control of the Directors who may allot or otherwise dispose of the same to such persons, on such terms and conditions, and either for cash or for a consideration other than cash, as the Directors think fit.
- (ii) The Company shall have the power to issue Redeemable Capital, by whatever name called liable to be redeemed, or liable at the option of the Company to be redeemed in any manner permissible under the provision of the Ordinance or conditions of any agreement for issue of such certificate or instrument:
 - The Redeemable Preference Shares shall be entitled to a preferential dividend at the rate fixed at the General Meeting of the Company.
 - The preferential dividend shall be cumulative.
 - The preference shareholder(s) shall only be entitled to preferential dividend and shall not be entitled to any other dividend (whether cash, bonus shares, right shares etc.) to which ordinary shareholders may become entitled from time to time.
 - The Redeemable Preference Shares shall be redeemed on redemption date or shall be converted into ordinary shares as deemed expedient by the Board of Directors. The Board of Directors shall also finalize other modalities & mechanism with regard to issue of Redeemable Preference Shares, payment of preferential dividend, redemption, conversion etc.
 - Redeemable Preference shareholders shall not be entitled to attend or vote at the meetings of shareholders of the Company.
- (iii) The Company may, upon terms and conditions contained in an agreement in writing, issue to one or more Scheduled Banks, Financial Institutions or such other persons as are specified for the purpose by the Federal Government by notification in the Official Gazette, either severally, jointly or through their syndicate, any instrument in the nature of Redeemable Capital in any or several forms in consideration of any funds, moneys, accommodations received or to be received by the Company whether in cash or specie or against any promise, guarantee, undertaking or indemnity issued to or in favour of or for the benefit of the Company, subject to the legal provisions, on the issue and Section 120 of the Ordinance.
- (iv) The Board shall, as regards any allotment of shares, duly comply with such provisions of Sections 68 to 73 as may be applicable.

SHARES FOR CONSIDERATION OTHER THAN CASH

- B. Subject to the provisions of the Ordinance and the Articles, the Board may allot and issue shares in the capital of the Company as payment or part payment for any property sold or transferred, goods or machinery supplied, or for services rendered to the Company in the conduct of the business or affairs, and any shares which may be so allotted may be issued as fully paid up shares, and if so issued, shall be deemed to be fully paid up shares.

FRACTIONAL SHARES

- 9. If and whenever as a result of an issue of new shares any consolidation or sub-division of shares any Member becomes entitled to hold shares in fractions, the Board shall not be required to offer or issue such fractional shares and shall be entitled to sell whole shares at a reasonable price and pay and distribute to and amongst the Members entitled to such fractional shares in due proportion the net proceeds of the sale thereof. For the purpose of giving effect to any such sale, the Board may authorize any person to transfer the shares sold to the purchaser thereof, and the purchaser shall be registered as the holder of the shares comprised in such transfer but he shall not be entitled to see the


 MUHAMMAD RIZWAN QURESHI
 Company Secretary
 K-ELECTRIC LIMITED

"The Board" shall mean the Directors from time to time of the Company acting at a meeting or through a committee of Directors or pursuant to written consent.

"The Company" means K-Electric Limited.

"The Chairman" means the Chairman of the Board appointed from time to time pursuant to the Articles.

"The Chief Executive" means the Chief Executive of the Company appointed from time to time pursuant to the Articles and the Ordinance.

"The Directors" means the Directors of the Company appointed from time to time pursuant to these Articles including alternate Directors.

"The Memorandum" means the Memorandum of Association of the Company as originally framed or as altered from time to time in accordance with the provisions of the Ordinance.

"The Ordinance" means the Companies Ordinance 1984, as amended and now in force in Pakistan, and any amendment or re-enactment thereof for the time being in force.

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

"The Seal" means the Common Seal of the Company.

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

"In writing" and "Written" includes printing, lithography and other modes of representing or reproducing words in a visible form.

"Words" importing the singular include the plural number and vice versa.

Words importing the masculine gender only include the feminine gender and words or expression contained in the Articles shall bear the same meaning as in the Ordinance.

Words importing persons include bodies corporate.

BUSINESS

4. The business of the Company shall include the several objects expressed in the Memorandum of Association or those which are within its scope and meaning and all incidental matters taken or to be taken in hand as the Directors in their discretion shall think fit, and all matters which may appear to the Directors to be expedient for attaining these objects. The business shall be carried on by or under the management of Directors, subject only to such control of General Meetings as is provided for by these Articles and the Ordinance.

PUBLIC COMPANY LIMITED BY SHARES

5. The Company is a Public Company with Limited Liability.

CAPITAL

6. The authorized share capital of the Company is Rs.125,000,000,000 (Rupees One Hundred Twenty Five Billion Only) divided into the following kinds of shares:-
 - i. Share Capital of Rs.115,000,000,000 (Rupees One Hundred Fifteen Billion Only) divided into 32,857,142,857 ordinary shares of Rs.3.50 each.
 - ii. Share Capital of Rs.10,000,000,000 (Rupees Ten Billion Only) divided into 2,857,142,857 Redeemable Preference Shares of Rs.3.50 each.

THE COMPANIES ORDINANCE, 1984 COMPANY LIMITED BY SHARES

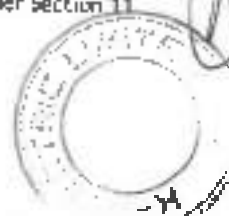
ARTICLES OF ASSOCIATION OF K-ELECTRIC LIMITED

PRELIMINARY

1. The Regulations contained in Table "A" referred to in Section 26 (2) in the First Schedule to the Companies Ordinance, 1984 (hereinafter called "the Ordinance") shall not apply to the Company except as may be reproduced herein.
2. The Regulations, for the management of the Company and for the observance of the Members thereof and their representatives, shall (subject to any exercise of the statutory powers of the Company in reference to the repeal or alteration of or addition to its regulations by Special Resolution as prescribed under the Ordinance) be such as are contained in these Articles.

DEFINITIONS


1. The Chapter heading shall not affect the construction hereof, and in these Articles, unless there is something in subject or context inconsistent therewith :
 - "Debenture" includes debenture stock, Bonds, Term Finance Certificates (TFC) and any other security other than the shares of the Company, whether constituting a charge on the assets of the Company or not.
 - "Dividend" means the distribution of profits of the Company to its members.
 - "Member" means a member of the Company within the meaning of clause (21) of subsection (1) of Section 2.
 - "Month" means a calendar month according to the English calendar.
 - "Office" means the Registered Office of the Company.
 - "Participatory Redeemable Capital" or PRC means such Redeemable Capital as is entitled to participate in the profit and loss of the Company.
 - "Person" shall include a body corporate.
 - "Proxy" includes an attorney duly constituted under a power of attorney.
 - "Redeemable Capital" includes finance obtained on the basis of Participatory Term Certificates (PTC), Mushaka Certificates, Term Finance Certificates (TFC), or any other security or obligation not based on interest as defined in Section 2(30A) of the Ordinance.
 - "Section" means section of the Ordinance.
 - "Special Resolution" has the meaning assigned thereto by clause (36) of subsection (1) of Section 2 of the Ordinance.
 - "The Articles" means those Articles of Association, as originally framed or as altered from time to time by Special Resolution.
 - "The Authority" means the Corporate Law Authority constituted under Section 11



- V. The share capital of the Company is Rs. 125,000,000,000 (Rupees One Hundred Twenty-Five Billion Only) divided into the following kinds of shares:
- i. Share Capital of Rs. 115,000,000,000 (Rupees One Hundred Fifteen Billion Only) divided into 32,857,142,857 ordinary shares of Rs. 3.50 each.
 - ii. Share Capital of Rs. 10,000,000,000 (Rupees Ten Billion Only) divided into 2,857,142,857 Redeemable Preference Shares of Rs. 3.50 each.

WE, the several persons whose names and addresses are subscribed, are desirous of being formed 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.

Dated this Sixth day of September 1913

Name of Subscriber	Address and Description of Subscriber	Number of Ordinary Shares taken by each Subscriber	Witness to Signature
T.L.F. Beaumont	Merchant, Karachi	1 (one)	
Ghulamali G. Chagla	Mercant, Karachi	1 (one)	
Nadkhanaw E. Dinshaw	Merchant, Karachi	1 (one)	
W.U. Nicholas	Merchant, Karachi	1 (one)	
E. Frank Jones	Merchant, Karachi	1 (one)	
Chellaram Dulloomal	Merchant, Karachi	1 (one)	
Abdool Rahim Saif Mahomed	Merchant, Karachi	1 (one)	

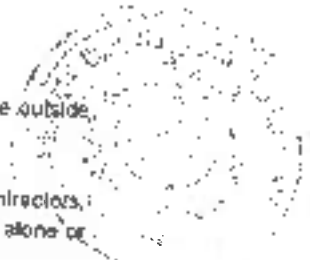
Certified to be True Copy

Deputy Registrar of Companies

ASPL

6/11/13

- 19. To borrow and raise money in such manner as the Company shall think fit and in particular by the issue of debentures, mortgage debentures, or debenture stock payable to bearer or otherwise and either permanent or redeemable or repayment and collaterally to secure any securities of the Company by means of a trust deed or otherwise.
- 20. To invest and deal with the moneys of the Company not immediately required upon such securities and in such manner as may from time to time be determined.
- 21. To make, draw, endorse, accept and negotiate Bills of Exchange, promissory notes or any other negotiable instruments
- 22. To receive money on deposit at interest or otherwise and to lend money, and in particular to customers and others having dealings with the Company and to guarantee the performance of any contracts.
- 23. To remunerate any person or company for services rendered in placing or assisting to place or in guaranteeing any of the shares in the Company's capital or any debentures or other Securities of the Company.
- 24. To indenture, contract or otherwise engage handicraftsmen and other workmen, skilled and unskilled and to import labour
- 25. To grant pensions, allowances, gratuities and bonuses to the persons employed by or trading with the Company and to aid in the establishment and support of and to subscribe to any association or institutions, calculated to benefit persons employed by the Company or having dealings with the Company.
- 26. To pay out of the funds of the Company all expenses which the Company may lawfully or by agreement with Government pay, incident to the formation, registration and advertising of or raising money for the Company by debentures or otherwise and the issue of its capital, including brokerage and commission for obtaining applications for or taking, placing or underwriting, shares, debentures or debenture stock and to apply at the cost of the Company to the Government of Pakistan or any other Government Authority, for any extension of the Company's powers.
- 27. To guarantee the performance of any contract.
- 28. To procure the Company to be registered or recognized in any country or place outside Pakistan and to keep Branch Registers.
- 29. To do all or any of the above acts in any part of the world as principals, agents, contractors, trustees or otherwise, and by or through trustees, agents or otherwise, and either alone or in conjunction with others.
- 30. To do all such other things as are incidental or conducive to the attainment of the above objects
- 31. And it is hereby declared that the word "company" in this clause shall be deemed to include any authority, partnership or other body of person whether incorporated or not incorporated, and the word "person" shall be deemed to include any partnership, association or other body of persons, and any company if the context so admits; and the intention is that the objects set forth in each of the several paragraphs of this clause have the widest possible construction, and shall be in no wise limited or restricted by reference to or inference from the terms of any other paragraph of this clause or name of the Company except as otherwise expressed therein.



[Handwritten Signature]

MUHAMMAD RIZWAN QALBA
 Company Secretary
 K-52/SEC-1/REG. UNIT-02

IV. The Liability of the Members is Limited.

- 9. To acquire, erect, construct, lay down, enlarge, alter and maintain any buildings, works, and machinery necessary or convenient for the Company's business.
- 10. To sell, lease, improve, manage, develop, mortgage, exchange turn to account or otherwise deal with, dispose of absolutely, conditionally, or for any, limited interest, and grant any leave or license in respect of all or any of the rights or privileges of the Company, and to distribute in specie as dividend or bonus any money, shares, stocks, debentures or debenture stock that may be accepted as consideration for any such sale, lease, exchange or other disposition.
- 11. To promote, amalgamate with or buy up any other Company for the purpose of acquiring all or any of the property and liabilities of this Company, or for any other purpose which may seem directly or indirectly calculated to benefit this other purpose which may seem directly or indirectly calculated to benefit this Company having and to take or otherwise acquire and hold shares in any other company objects altogether or in part similar to those of this Company, or carrying on any business capable of being conducted so as directly or indirectly to benefit this Company.
- 12. To enter into partnership or into any arrangement for sharing profits, union of interest, co-operation, joint venture, reciprocal concession, or otherwise with any person or company carrying on or engaged in or about to carry on or engage in any business or transaction capable of being conducted so as to directly or indirectly benefit this Company, and to lend money 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.
- 13. To carry on any other business which may seem to the Company capable of being conveniently carried on in connection with the above or calculated to directly or indirectly enhance the value of or render profitable any of the Company's property or rights.
- 14. To enter into any arrangement with any Government or authority, supreme, municipal, local or otherwise that may seem conducive to the Company's objects or any of them; to obtain from any such Government or authority any rights, privileges, and concessions which the Company may think desirable to obtain and carry out, exercise and comply with any such arrangements, rights, privileges and concessions, and to apply for and obtain licenses, provisional orders, special Acts or other statutory or parliamentary authority for supplying electricity for any public or private purpose.
- 15. To promote any Bill or Bills in any parliament or any application or applications to any public authority for any order, provisional order or license and to enter into any contract to bear and pay the expenses of or in connection with the same or arising there out, and to underwrite or guarantee the capital required for carrying out any undertaking authorized by any such Act, order or license.
- 16. To purchase or otherwise acquire any patents, brevets d'inventions, licenses, concessions and the like conferring any exclusive or non-exclusive or limited right to use any invention which may seem capable of being used for any of the purposes of the Company or, the acquisition of which may seem calculated directly or indirectly to benefit the Company, and to use, exercise, develop or grant licenses in respect of, or otherwise turn to account, the property and right so acquired. ✓
- 17. To pay for any property or rights acquired by the Company either in cash or shares with or without preferred or deferred right, in respect of dividend or repayment of capital, or otherwise, or by any securities which the Company has power to issue or partly in one mode and partly in another and generally on such terms as the Directors may approve.
- 18. To issue all or any part of the original or other share capital whether preference or ordinary shares of the Company at par or at premium or at discount and as fully or partly paid up.



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THE COMPANIES ORDINANCE 1984
COMPANY LIMITED BY SHARES

MEMORANDUM OF ASSOCIATION
OF
K-ELECTRIC LIMITED

- I. The name of the company is K-Electric Limited.
- II. The registered offices of the Company will be situated in Karachi, Sindh, Pakistan.
- III. The objects for which the Company is established are :
 1. To carry on at Karachi and elsewhere in Pakistan, the business of an electric light company in all its branches and in particular to construct, lay down, establish and fix all necessary cables, wires, lines, accumulators, lamps and works and to generate, accumulate, transmit, distribute and supply electricity and to light cities, towns, streets, docks, markets, theaters, buildings and places both public and private.
 2. To carry on the business of Electrical Engineers, Electricians, Engineers, and Contractors, Shopkeepers, Agents and Manufacturers of Electrical apparatus, and of generating, producing and supplying light, heat, sound and power by electricity, galvanism, magnetism or otherwise, suppliers of electricity whether for the purposes of light, heat, motive power, telephonic, telegraphic industrial or other purposes and generally to provide, work, maintain and carry out all necessary cables, wires, accumulators, lamps exchanges telephones and apparatus.
 3. For the purposes of the above section, to buy, sell, hire or deal in cables, wires, accumulators, lamps, exchanges, telephones, fittings and furniture and apparatus of every kind with special reference to apparatus connected with the producing, storing, supplying, using, regulating or measuring the supply or facilitating the use of electricity or electrical currents or force.
 4. To buy, sell, hire, manufacture, deal in, turn to account, plant, machinery, implements, convenience, provisions, articles and products capable of being used in connection with the operations of or required by workmen and others employed by the Company or incidentally or conveniently connected with any such business as aforesaid.
 5. To construct, purchase, lease or otherwise acquire any tramways, railways, aerial ropeways or any other means of transport by land, air or water.
 6. To equip and to maintain and work by electricity, steam, petrol or other mechanical power or by animal power, all tramways, railways, aerial ropeways or other means of transport by air, land or water in which the Company may at any time be interested.
 7. To carry on the business of tramways, railways, omnibus and van proprietors and carriers of passengers and goods by air, land or water and of manufacturers of and dealers in tramways, carriages, trucks, locomotives, launches, accumulators, dynamos and other chattels and effect and conveniences required for making, maintaining equipping and working tramways, railways, aerial ropeways or any other means of transport by air, land or water.
 8. To purchase, take in, exchange or lease rent, occupy or otherwise acquire any lands, hereditaments and estates and any property and effects thereon or used or connected therewith and to acquire any grants, concessions, leases, rights, easements, licenses, privileges, and any other interests in land.


RISHABD KISHOR DALLA
Company Secretary
K-ELECTRIC LIMITED

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[Handwritten Signature]
MUSAMMAD JAWAN DALLA
 Company Secy
 K-25, ECTF

K-Electric Limited

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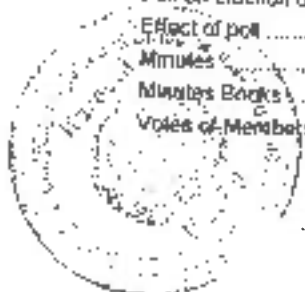
MEMORANDUM OF ASSOCIATION

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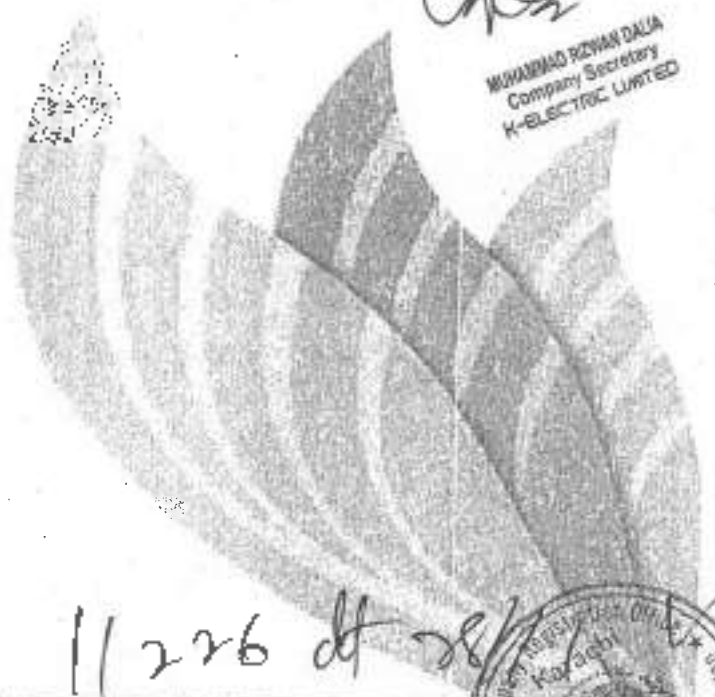


K-ELECTRIC LIMITED



MEMORANDUM & ARTICLES OF ASSOCIATION

MUHAMMAD RIZWAN DALIA
Company Secretary
K-ELECTRIC LIMITED



11226 dt 28/1/2017



Certificate of Commencement of Business

K-Electric Limited (KE) formerly known as the "Karachi Electric Supply Company Limited (KESCL)" was incorporated as a Joint Stock Company under Indian Companies Act 1882 on 13 September 1913. Certificate of Registry / Incorporation was accordingly issued by the Registrar of Joint Stock Companies, Bombay, which was conclusive evidence pursuant to the provisions of the above-named Act. Had Certificate of commencement of business was a statutory requirement at that time, the same had also been issued. Governor of Bombay sanctioned Karachi Electric License 1913 on 27 August 1913 and the Company after completing the above legal and statutory requirements, commenced business in 1913. The Company has been continuously engaged in the business of generation, transmission and distribution of electricity since 1913 and has obtained all requisite licenses and certificates pursuant to various enactments from time to time.

Business of the Company is continuing since 1913 and applying for issuance of Certificate of Commencement of Business at this stage would be illogical. In post independence era, Company also obtained a Certificate from Registrar Joint Stock Companies, Karachi, on 16 March 1953 confirming incorporation of the Company on 13 September 1913. Pursuant to promulgation of Companies Ordinance 1984, the Company complies with the requirement of Section 513 as under:

Section 513. Transitional provisions. - Within one year from the commencement of this Ordinance, all companies shall alter their memorandum and articles or any existing contract or agreement and shall take such other actions as are necessary to bring the constitution, working and procedures of the company in conformity with the provisions of this Ordinance:

Provided that, notwithstanding the fact that such actions have not been taken or such changes have not been made, the companies shall comply with the provisions of this Ordinance as if they were registered under this Ordinance.

Memorandum & Articles of the Company were amended, approved at AGM and registered with the Registrar Joint Stock Companies.

Neither in 1953 at the time of issuing fresh Certificate of Incorporation, nor in 1985 at the time of registration of revised Memorandum & Articles of Association, the Company was required to apply for issue of Certificate of Commencement of Business, which clearly indicates and substantially confirms that all the registration requirements and certifications issues were fully complied with and the Registrar did not see any rationale to ask for Certificate of Commencement of Business. Section 440 of Companies Ordinance 1984 specifies as under:

Section 440. Application of Ordinance to companies formed and registered under previous Companies Acts. - This Ordinance shall apply to existing companies as follows:-

- (a) In the case of a limited company other than a company limited by guarantee, this Ordinance shall apply in the same manner as if the company had been formed and registered under this Ordinance as a company limited by shares;

Formerly Karachi Electric Supply Company Limited
K-Electric Limited, KE House, 39-B, Sunset Boulevard, DHA II, Karachi, Pakistan
Phone: 92-21-32637133, UAN: 111-537-211, Fax: 92-21-99205165, Website: www.ke.com.pk



K-ELECTRIC LIMITED

(b) in the case of a company limited by guarantee, this Ordinance shall apply in the same manner as if the company had been formed and registered under this Ordinance as a company limited by guarantee; and

(c) In the case of a company other than a limited company, this Ordinance shall apply in the same manner as if the company had been formed and registered under this Ordinance as an unlimited company;

Provided that reference, express or implied, to the date of registration shall be construed as a reference to the date at which the company was registered under the previous Companies Act concerned.

During last more than six decades, KE was listed on Karachi, Lahore, Islamabad Stock Exchanges, registered with CDC, obtained Electric licenses from Government of Sindh, Baluchistan and lately from NEPRA, entered into a number of financing facilities agreements with local and international financial institutions and finally the Company was privatized in November 2005 preceded by comprehensive due diligence conducted by Price Waterhouse Cooper (WPC). There was no demand from any institution to obtain Certificate of Commencement of Business as they were fully knowledgeable of the fact that the Company has been continuing the business since 1913.

Moreover, name of the Company was first changed on 9 January 2008 from "Karachi Electric Supply Corporation Limited" to "Karachi Electric Supply Company Limited" and then on 16 January 2014 from "Karachi Electric Supply Company Limited" to "K-Electric Limited". SECP approved the above two (2) name changes and accordingly issued fresh Certificate of Incorporation dated 9 January 2008 and 16 January 2014 respectively and consequently revised Memorandum & Articles of Association were filed and registered with SECP. The above name change processes were completed without conditioning or referring to the issue of Certificate of Commencement of Business.

In view of the above, we understand that requirement of obtaining "Certificate of Commencement of Business, pursuant to Section 146 of the Companies Ordinance 1984" is not applicable in KE's case.



MUHAMMAD RIZWAN DALLA
Company Secretary
K-ELECTRIC LTD LIMITED

Annexure "E"
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Form A

THE COMPANIES ACT, 2017
THE COMPANIES (GENERAL PROVISIONS AND FORMS) REGULATIONS, 2018
(Section 120(1) and Regulation 4)

ANNUAL RETURN OF COMPANY HAVING SHARE CAPITAL

PART-I

No. of company in proprietor or in stock exchange

1.1. CLAN (Registration Number)

0 0 0 0 0 0 0 0 0 0

1.2. Name of the Company

K-Electric Limited

1.3. Fee Payment Details S.S.3

Chalan No.

S.S.3 Amount

1.4. Form A made up to

0 0

0 0

0 0

0 0

1.5. Date of AGM

0 0

0 0

0 0

0 0

for Financial Year 2018



PART-II

Section 2

2.1. Registration office address

EE House, 55-4, Jinnah Boulevard, Phase-8, GHA, Karachi

2.2. Email Address

karachi@ke.com.pk

2.3. Office Tel. No.

(021) 3383 7100 / 3370 0150

2.4. Older Tel. No.

(021) 0920 5192 / 0920 0275

2.5. Principal line of business

Generation, Transmission & Distribution of Electricity within the licensed area.

2.6. Mobile No. of Authorized officer

(Chief Executive/ Director/ Company Secretary/ Chief Financial Officer)

2.7. Authorized Share Capital

Class and kind of Shares	No. of Shares	Amount	Face Value
Ordinary Shares	31,457,142,857	31,457,142,857	1.00
Redeemable Preference Shares	1,897,142,857	18,971,428,570	1.00

2.8. Paid up Share Capital

Class and kind of Shares	No. of Shares	Amount	Face Value
Ordinary Shares	27,625,296,210	27,625,296,210	1.00



(Signature)

MUHAMMAD SHIRAZ QASBI
Company Secretary
K-ELECTRIC LIMITED

2.9 Particulars of the holding / subsidiary company, if any

Name of holding company	Holding	% of share held
MPS Power Limited Floor 4, Yellow Road Cricket Square, Grand Cayman Cayman Islands	18,315,542,479	66.10%

2.10 Chief Executive Officer

Name	Syed Akbarul Haque Qureshi
Address	House 2 45/77, Street 10/26, Durrani-e-Madina, Phase-IV, DHA, Karachi
NIC No.	4 2 2 0 1 - 6 8 2 6 1 9 1 - 3

2.11 Chief Financial Officer

Name	Muhammad Asim Ghauri
Address	24-L-1, Block-7, PECHS, Karachi
NIC No.	4 2 2 0 1 - 2 8 0 9 1 1 8 - 3

2.12 Company Secretary

Name	Muhammad Farhan Qureshi
Address	M.M. 117, Rough Cooperative Housing Society, Block P-3, Karachi
NIC No.	4 2 2 0 1 - 2 8 4 2 8 6 9 - 3

2.13 Legal Advisor

Name	Ms. Ahd E. Server & Co
Address	Plot 208, 08th of Durrani, DC-1, Block-3, Cricket Square (M.A.S. Karachi)

2.14 Particulars of Auditor(s)

Name	Audit
A.J. Ferguson & Co., Chartered Accountants	State 14th Building No. 3-C, 16 Chundrigar Road, P.O. Box 4715, Karachi-74000
MDQ Ghaffar & Co., Chartered Accountants	2 nd Floor, Block-C, Leoban Square, Building No. 2, Service Station Road, Karachi-74301

2.15 Particulars of Share Registrar

Name	CDC Share Registrar Services Limited (CDRSRL)
Address	CDC House, 97-B, Block-8, S.A.C.C.H.S., Abul Kalam Afdal Road Karachi
e-mail	info@cdrsrl.com



Muhammad Farhan Qureshi
 MUHAMMAD FARHAN QURESHI
 Company Secretary
 K-ELECTRIC LIMITED



Section 8
7.16 List of Directors as on the date of annual return

S/N	Name	Address	Nationality	NIC No. (Photograph of Director to be attached)	Date of appointment or election
1	Samuel Mwangi Mwangi	12th Floor, Nairobi County House, P.O. Box 20000, Nairobi-KENYA	Kenyan	4004-430345-7	30.07.2018
2	Samuel Mwangi Mwangi	House 2 4022, Nyeri Road, P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
3	Abdullahi Mwangi	A.P. Mwangi, P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018
4	Dr. Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
5	Dr. Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018
6	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
7	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018
8	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
9	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018
10	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
11	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018
12	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4701-400345-7	30.07.2018
13	Samuel Mwangi Mwangi	P.O. Box 20000, Nairobi, Kenya	Kenyan	4004-430345-7	30.07.2018



(Signature)
MUHAMMAD RIZWAN DAIK
 Company Secretary
 K-ELECTRIC LIMITED

2.27 List of members & Ordinary holders of the company as on the date of filing Form 2 (contd)

Sl	Full Name	Place	Address	Nationality	No. of shares held/holdings	NIC No. (Persons No. if Foreigner)
List classified as						
	Member-B	Ordinary Physical Shareholder				
	Member-C	Ordinary Shareholders in CDS				
	Member-D	PSEB-4 Members				
Members holding 10% or more ordinary shares						
	* 225 Member Ltd	COC A/c F 307 Fardis			18,325,847,676	64-9396
	* President of PSEB-4 / CDP	Folio B LEP			6,798,323,778	24,366

2.28 Transfer of shares (where filed Form 2 with note)

Sl	Name of Transferor	Name of Transferee	Number of shares transferred	Date of registration of transfer
		Details attached at Annex E	Ordinary Shares	

Particulars

2.1 Declaration:
 I do hereby solemnly and sincerely declare that the information provided in the form is:
 (i) true and correct to the best of my knowledge, in accordance with the facts as contained in the Company and nothing has been concealed and
 (ii) hereby reported after complying with and fulfilling all requirements under the respective provisions of law, rules, regulations, bye-laws, charters and regulations whichever is applicable.

2.2 Name of Authorized Officer with Designation Authorized Intermediary: **Muhammad Rizwan Daulti, Chief People Officer & Company Secretary, EE**

2.3 Signature:

2.4 Registration No. of Authorized Intermediary, if applicable: **N/A**

2.5 CMC: **11 12 2019**

INSTRUCTIONS FOR FILING FORM-2

1. The applicant to register on the date of filing of the Company or the date of the transfer of shares as per Form 2 shall file the form.
2. Under the heading 'No. of shares held' the applicant should file the number of shares held in the name of the applicant as per the entries in the books of the Company.
3. If the applicant is a foreigner, the applicant should file the number of shares held in the name of the applicant as per the entries in the books of the Company.
4. In case of transfer of shares, the applicant should file the number of shares transferred in the name of the transferee as per the entries in the books of the Company.
5. This form is to be filed within 30 days of the date of filing of the Company or the date of the transfer of shares.

Certified to be true Copy
 Asst. Secy. Joint Registrar of Companies



MUHAMMAD RIZWAN DAULTI
 Company Secretary
 K-ELECTE



Annex F

2019 Annual Report separately attached.

Approved "C" 54



**Certified True Copy (CTC) of Resolutions dated 14 April 2020
passed by KE Board of Directors**

RLNG SPUR PIPELINE FOR BQPS-IN (900MW CCPP)

IT BE AND IS HEREBY RESOLVED THAT

K-Electric Limited be and is hereby authorized to file a petition with Oil and Gas Regulatory Authority (OGRA) to issue Transmission License to the Company and to invite bids for construction, operation and maintenance of the Spur Pipeline for supply of RLNG to KE's 900 MW RLNG Combined Cycle Power Plant (BQ-MI) at Bm Qasim;

Chief Executive Officer (CEO), jointly with any one of the Chief Generation & Transmission Officer (CGTO) and Chief Financial Officer (CFO), be and are hereby authorized to (i) finalize and sign the petition, after completing statutory requirements and legal review by internal / external legal counsels, for filing with OGRA to issue transmission license to the Company (ii) to obtain the Right of Way and any other Government approvals and (iii) negotiate the EPC contract subject to review by BS&PC and approval by the Board;

CEO, jointly with any one of the CGTO and CFO, be and are hereby further authorized to take all necessary actions and sign such other deeds, documents, instruments, undertakings etc. incidental and related to the execution and filing of petition with OGRA, for and on behalf of the Company. CEO, jointly with any one of the CGTO and CFO, be and are hereby further authorized to delegate their powers to any KE officer, as they deem fit, to sign such other deeds, documents, instruments, undertakings etc. incidental and related to the execution and filing of the petition with OGRA and appear before any authority including OGRA and admit execution thereof for and on behalf of the Company.

**Muhammad Rizwan Dalk
Chief People Officer & Company Secretary**



**MUHAMMAD RIZWAN DALIK
Company Secretary
K-ELECTRIC LIMITED**

Certificate of Incorporation

LLOYA RANKING
DO HANHEHY CERTIFY, pursuant to the provisions of the Companies Act, 1961, that all requirements of the said Act in respect of registration have been complied with by

EXUS POWER LTD

an Exempted Company incorporated in the Cayman Islands with limited liability with effect from the 27th day of July 1986. The issued file

When under my hand and Seal at George Town in the State of Grand Cayman this 27th day of July 1986.



Assistant Registrar of Companies,
 Cayman Islands, B.V.I.



Certified as a true and correct copy

By: *[Signature]*

Maples and Calder
 The Exchange Building 5th Floor
 Dubai International Financial Centre
 PO Box 139980, Dubai, UAE

Date: 27/07/86
 H. M. J. ...
 H. M. J. ...

Handwritten: "H" / 56

Final Version

THE COMPANIES LAW (AS AMENDED)
COMPANY LIMITED BY SHARES
AMENDED AND RESTATED
MEMORANDUM AND ARTICLES OF ASSOCIATION
OF
KES POWER LTD.

(ADOPTED BY SPECIAL RESOLUTION DATED 18 MAY 2009)

Certified as a true and correct copy

By: [Signature]
Naples and Calder
The Exchange Building, 5th Floor
Cubal International Financial Centre
PO Box 119980, Dubai, UAE

Date: 8 APRIL 2010
[Signature]
RESIDENT

WALKERS

Walker House, 27 Avery Street, George Town
Grand Cayman KY1-9001, Cayman Islands
T 345 949 8100 F 345 949 7966 www.walkerskbci.com

REF: VCI/b/A 1842.56427



Final Version

THE COMPANIES LAW (AS AMENDED)

COMPANY LIMITED BY SHARES

AMENDED AND RESTATED
MEMORANDUM OF ASSOCIATION

OF

KES POWER LTD.

(ADOPTED BY SPECIAL RESOLUTION DATED 18 MAY 2009)

1. The name of the Company is KES Power Ltd. (the "Company").
2. The registered office of the Company will be situated at the offices of Bank of Bermuda (Cayman) Limited, PO Box 513 OT, Strathvada House, George Town, Grand Cayman, Cayman Islands or at such other location as the Directors may from time to time determine.
3. The objects for which the Company is established are restricted to the following:
 - (a) acquiring in one or more transactions shares ("Shares") issued by Karachi Electric Supply Company Limited, a company existing under the laws of the Islamic Republic of Pakistan ("KESCO");
 - (b) exercising any rights attached to Shares from time to time;
 - (c) disposing of any Shares from time to time in one or more transactions;
 - (d) making loans or otherwise providing finance to KESCO;
 - (e) issuing shares from time to time;
 - (f) borrowing or otherwise incurring indebtedness for the purpose of acquiring Shares or making investments in KESCO (including, without limitation, by way of loan or other accommodation) from time to time;
 - (g) underwriting any rights issue proposed by KESCO; and
 - (h) entering into any agreements, documents or arrangements necessary, incidental or conducive to the accomplishment of the foregoing or to any of the transactions contemplated thereby.
4. The Company shall have and be capable of exercising all the functions of a natural person of full capacity irrespective of any question of corporate benefit as provided by Section 27(2) of the Law.
5. The Company will not trade in the Cayman Islands with any person, firm or corporation except in furtherance of the business of the Company carried on outside the Cayman Islands; provided that nothing in this section shall be construed as to prevent the Company effecting and concluding contracts in the Cayman Islands, and exercising in the Cayman Islands all of its powers necessary for the carrying on of its business outside the Cayman Islands.
6. The liability of the members of the Company is limited to the amount, if any, unpaid on the shares respectively held by them.

Certified as a true and correct copy

By: *Abdullah Calder*
 Maples and Calder
 The Exchange Building 5th Floor
 Dubai International Financial Centre
 PO Box 119980, Dubai, UAE

Date: 3 April 2010
Abdullah Calder
 Associate



- 7. The capital of the Company is US\$50,000.00 divided into 5,000,000 Class O shares of a nominal or par value of US\$0.01 each provided always that subject to the Law and the Articles of Association the Company shall have power to redeem or purchase any of its shares and to subdivide or consolidate the said shares or any of them and to issue all or any part of its capital whether original, redeemed, increased or reduced with or without any preference, priority, special privilege or other rights or subject to any postponement of rights or to any conditions or restrictions whatsoever and so that unless the conditions of issue shall otherwise expressly provide every issue of shares whether stated to be ordinary, preference or otherwise shall be subject to the powers on the part of the Company hereinafter provided.
- 8. The Company may exercise the power contained in Section 228 of the Law to deregister in the Cayman Islands and be registered by way of continuation in some other jurisdiction.

CERTIFIED TO BE A TRUE AND CORRECT COPY

SIC. *MELANIE E. RIVERS-WOODS*
 Assistant Registrar
 Date 3rd June 2009



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Certified as a true and correct copy

By: *Abbas Khan*

Maples and Calder
The Exchange Building 5th Floor
Dubai International Financial Centre
PO Box 119980, Dubai, UAE

Date: 8 April 2010
*BY: AYIA BASAK
ASSOCIATE*

THE COMPANIES LAW (AS AMENDED)
COMPANY LIMITED BY SHARES
AMENDED AND RESTATED
ARTICLES OF ASSOCIATION
OF
KES POWER LTD.

(ADOPTED BY SPECIAL RESOLUTION DATED 18 MAY 2008)

TABLE A

The Regulations contained or incorporated in Table 'A' in the First Schedule of the Law shall not apply to Kes Power Ltd. (the "Company") and the following Articles shall comprise the Articles of Association of the Company.

INTERPRETATION

In these Articles the following defined terms will have the meanings described to them, if not inconsistent with the subject or context.

"Abraja" means KGC SPV 21 Limited, an exempted company incorporated with limited liability under the laws of the Cayman Islands;

"Abraja Director" means each five persons (or less) as have been appointed in writing by Abraja to act as Abraja Directors;

"Al Jomaih" means Al Jomaih Power Limited, an exempted company incorporated with limited liability under the laws of the Cayman Islands;

"Al Jomaih Directors" means such three persons (or less) as have been appointed in writing by Al Jomaih to act as Al Jomaih Directors;

"Business Day" means a day (other than a Friday or Saturday) in which banks are usually open in Dubai and Karachi for normal business;

"Capital Call Limit" means US\$920 million;

"Chairman" means such Director as appointed from time to time by Abraja or, in the event that Abraja is no longer a Shareholder of the Company, such other person nominated by the Directors;

"Class O Share" means a Class O Share in the capital of the Company, including a fraction of a Class O Share, having the rights and entitlements set out herein;

"Deed of Adherence" means a deed of adherence in the form attached to the Shareholder Agreement whereby a transferee of shares undertakes to assume the duties and obligations of the transferor of such shares under the Shareholder Agreement and to be bound by the Shareholder Agreement;

"Denham" means Denham Investment Ltd., an exempted company incorporated with limited liability under the laws of the Cayman Islands;



"Denham Directors" means such two persons (or less, as have been appointed in writing by Denham) to act as Denham Directors;

"Directors" and "Board of Directors" means the Directors of the Company for the time being, or as the case may be, the Directors assembled as a Board or as a committee thereof;

"Financial Year-End" means 31 December in each year;

"Further Subsidiary Ordinary Shares" means any ordinary shares in the capital of the Subsidiary issued by the Subsidiary from time to time and held by the Company in addition to its holding of the Subsidiary Shares;

"Group" means the Company, KESC and their respective subsidiaries from time to time and Group Company means any of them;

"Law" means the Companies Law (as amended) of the Cayman Islands;

"Member" means a person whose name is entered in the Register of Members and includes each subscriber to the Memorandum of Association pending the issue to him of the subscriber share or shares;

"Memorandum of Association" means the Memorandum of Association of the Company, as amended and re-stated from time to time;

"Ordinary Resolution" means a resolution:

- (a) passed by a simple majority of such Members as, being entitled to do so, vote in person or, where proxies are allowed, by proxy at a general meeting of the Company and where a poll is taken regard shall be had in computing a majority to the number of votes to which each Member is entitled; or
- (b) approved in writing by all of the Members entitled to vote at a general meeting of the Company in one or more instruments each signed by one or more of the Members and the effective date of the resolution so adopted shall be the date on which the instrument, or the last of such instruments if more than one, is executed;

"paid up" means paid up as to the par value and any premium payable in respect of the issue of any shares and includes credited as paid up;

"Person" means any natural person, firm, company, joint venture, partnership, corporation, association or other entity (whether or not having a separate legal personality) or any of them as the context so requires.

"Quarter End" means each of 31 March, 30 June, 30 September and 31 December in each year;

"Register of Members" means the register to be kept by the Company in accordance with Section 40 of the Law;

"Reserved Matter" means those matters which are not otherwise reserved at Law for the Members that shall not be undertaken without the consent of Abrar, Al Jomaih and Denham (it being acknowledged by each party that some of the following matters are within the competence of the Board), being the following:

- (a) any amendment to the constitutional documents of the Subsidiary;



- (b) any alteration of the Financial Year end or (except insofar as is necessary to comply with International Financial Reporting Standards) of the accounting policies or practices of The Subsidiary;
- (c) any alteration (except insofar as is necessary to comply with International Financial Reporting Standards) of the accounting policies or practices of the Company;
- (d) the declaration or distribution of any dividend or other payment (whether in cash or in specie) out of the distributable reserves of the Company or its Subsidiary or the reduction of any other reserve of the Company or its Subsidiary;
- (e) any change in the auditors of the Subsidiary;
- (f) the solvent liquidation, winding-up or dissolution of the Subsidiary;
- (g) any issuance by the Company or its Subsidiary of any debenture or loan stock or any writ by the Company of any loan or guarantee, in each case other than as provided for in the Sources of Funds except where this would require an amendment to these Articles and the Memorandum of Association;
- (h) any arrangement for a joint venture, partnership or other business organisation by the Company or its Subsidiary, with a value in excess of US\$250 million (rising to US\$500 million following completion of all of the Abraj Capital Cases);
- (i) any merger or acquisition of by the Company or its Subsidiary with a value in excess of US\$200 million rising to US\$500 million following completion of all of the Abraj Capital Cases);
- (j) any change in the nature of the business of the Company or any Group Company not contemplated by these articles of association or other constituent documents of the Company;
- (k) making any loans or guarantees by the Company or its Subsidiary that are not related to the business of the Company or its Subsidiary;
- (l) any action or omission that would create a lien over the shares of the Subsidiary (other than any lien created in respect of any financing of the Subsidiary up to an amount provided for in the Sources of Funds);
- (m) the approval, renewal, modification, termination or any action regarding the Services Contract (other than in accordance with the terms of the Shareholders Agreement); and
- (n) the admission of a new shareholder to the Company other than in accordance with the terms of the Shareholders Agreement).

"Seal" means the Common Seal of the Company (if adopted) including any facsimile thereof;

"Services Contract" means the services contract between the Subsidiary and/or the Company and Abraj Investment Management Limited (or its nominee);

"share" means any share in the capital of the Company, including a fraction of any share;

"Shareholder" means, in respect of any Share, the person whose name is entered in the Register of Members in respect thereof and "Class O Shareholder" shall be construed accordingly;

"Shareholder Agreement" means the Shareholder Agreement dated 15 October 2005 as amended from time to time;

"signed" includes a signature or representation of a signature affixed by mechanical means;



"Sources of Funds" means the sources of funds set out in Schedule 1 to the Shareholders' Agreement;

"Special Resolution" means a resolution;

- (a) passed by 100% of such Members as, being entitled to do so, vote in person or, where proxies are allowed, by proxy at a general meeting of the Company of which notice specifying the intention to propose the resolution as a Special Resolution has been duly given and where a poll is taken regard shall be had in computing a majority to the number of votes to which each Member is entitled; or
- (b) approved in writing by all of the Members entitled to vote at a general meeting of the Company in one or more instruments each signed by one or more of the Members and the effective date of the Special Resolution so adopted shall be the date on which the instrument or the first of such instruments if more than one, is executed;

"Subsidiary" means Karachi Electric Supply Company Limited, a public limited company existing under the laws of Pakistan;

"Subscription Agreement" means the Subscription Agreement dated 15 October 2008 as amended from time to time;

"Subsidiary Ordinary Shares" means ordinary shares in the capital of the Subsidiary; and

"Subsidiary Preference Shares" means any preference shares issued by the Subsidiary.

2. In these Articles, save where the context requires otherwise:

- (a) words importing the singular number shall include the plural number and vice versa;
- (b) words importing the masculine gender only shall include the feminine gender;
- (c) words importing persons only shall include companies or associations or bodies of persons, whether corporate or not;
- (d) "may" shall be construed as permissive and "shall" shall be construed as imperative;
- (e) references to a "dollar" or "dollars" or "\$" is a reference to dollars of the United States; and
- (f) references to a statutory enactment shall include reference to any amendment or re-enactment thereof for the time being in force.

3. Subject to the last two preceding Articles, any words defined in the Law shall, if not inconsistent with the subject or context, bear the same meaning in these Articles.

PRELIMINARY

- 4. The business of the Company may be commenced as soon after incorporation as the Directors see fit, notwithstanding that part only of the Shares may have been allotted or issued.
- 6. The registered office of the Company shall be at such address in the Cayman Islands as the Directors shall from time to time determine. The Company may in addition establish and maintain such other offices and places of business and agencies in such places as the Directors may from time to time determine.



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SHARES

- 6. No Class O Shares shall be issued to any person who is not an existing Member unless such person enters into a Deed of Adherence and becomes a party to the Shareholders Agreement.
- 7. The Board shall make capital calls in accordance with the terms of the Shareholders Agreement.
- 8. The Board shall, from time to time with Abraxj consent (but in any event in accordance with the timetable set out in Schedule 10 of the Shareholders Agreement), make a capital call or a series of capital calls on Abraxj up to an aggregate amount, when taken together with the Subscription Price (as defined in the Subscription Agreement), of US\$361,327,000 (each an Abraxj Capital Call). An Abraxj Capital Call shall be made by notice to Abraxj and shall include (i) the total aggregate number of Class O Shares to be subscribed; (ii) the date of closing with respect to the subscription of the Class O Shares, being not less than 30 days following the date of the notice (an Abraxj Capital Call Closing Date); and (iii) the transfer instructions with respect to the payment of the applicable subscription price. Abraxj shall, on an Abraxj Capital Call Closing Date, pay the subscription price for the relevant Class O Shares and, on receipt, the Company shall issue those Class O Shares to Abraxj and deliver to Abraxj duly executed share certificates evidencing the Class O Shares. For the avoidance of doubt, each issue of Class O Shares pursuant to an Abraxj Capital Call shall be made free of any pre-emption rights in favour of the other Members and each other Member hereby irrevocably waives any pre-emptive rights it may have in respect of such issue of Class O Shares to Abraxj.
- 9. Subject to Articles 7 and 12, the Board may from time to time make capital calls on Members pro rata to their holdings of Class O Shares (a Capital Call) which in aggregate shall not exceed the Capital Call Limit. A Capital Call shall be made by notice to every Member and shall include (i) the total aggregate number of Class O Shares to be subscribed and the number of Class O Shares allocated to each Member (such allocation to be pro rata to each Member's holding of Class O Shares); (ii) the date of closing with respect to the subscription of the Class O Shares, being not less than 30 days following the date of the notice (the Capital Call Closing Date); and (iii) the transfer instructions with respect to the payment of the applicable subscription price. Each Member shall, on the Capital Call Closing Date (as set out in the relevant notice), pay the subscription price for the Class O Shares allocated to it and, on receipt, the Company shall issue those Class O Shares to that Member and deliver to that Member duly executed share certificates evidencing its Class O Shares.
- 10. If, with respect to any Capital Call made in accordance with Article 9 above or as approved by the Members in accordance with Article 11 below, a Member fails to subscribe for its required number of Class O Shares (as set out in the relevant Capital Call notice (the Default Shares)) on the Capital Call Closing Date and fails to subscribe for all such Class O Shares within five Business Days after the service of a notice on that Member of such failure then all of the Default Shares shall be offered to the other Members for subscription at the same subscription price (in the case of competition, such Default Shares to be allocated between the other Members on a pro rata basis).
- 11. Any Capital Call proposed by the Board which exceeds the Capital Call Limit (or such other amount as agreed by the Members from time to time), shall require a simple majority approval of the Members (following good faith consultation between the Members as to the funding requirements of the Company and its Subsidiary and the ability of the Company or its Subsidiary to obtain such funding from alternative sources), such approval not to be unreasonably withheld or delayed.
- 12. Other than in respect of sub clause 9.1 or 9.3 of the Shareholders Agreement, no capital call shall be made on the Members until Abraxj has fully complied with Abraxj Capital Calls of an aggregate amount, when taken with the Subscription Price (as defined in the Subscription Agreement), of US\$361,327,000. To the extent that, notwithstanding this, it is agreed by the



parties that a capital call should be made, it is acknowledged that such capital call should be on a pro rata basis (with such pro rata proportion being calculated on the assumption that Abraaj has subscribed in full for the Total Shares (as defined in the Shareholders Agreement)).

13. No Class O Shares shall be issued to any person who is not an existing member unless such person enters into a Deed of Adherence and becomes a party to the Shareholders Agreement.
14. The authorized share capital of the Company as at the date of adoption of these Articles is US\$50,000 divided into 5,000,000 Class O Shares of a nominal or par value of US\$0.01 each.
15. The rights and restrictions attaching to the Class O Shares are as follows:

(a) Dividends

Holders of Class O Shares shall be entitled to be paid in respect of each fiscal year by way of dividend such amounts as are lawfully available for distribution, subject always to the provisions of Article 121, and the consent of Abraaj, Al Jomaih and Denham.

(b) Voting

(i) Holders of the Class O Shares shall have the right to receive notice of, attend, speak and vote at general meetings of the Company and shall be entitled to one vote in respect of each Class O Share held.

(ii) The Directors shall obtain the prior written approval of Al Jomaih, Denham and Abraaj (but only in so far as such entity is a Shareholder) prior to considering, approving or entering into any Reserved Matters.

(c) Redemption

No Class O Share shall be redeemable at the option of the holder thereof.

(d) Return of Capital on Liquidation

On a return of capital on liquidation or winding up of the Company, the holders of the Class O Shares shall be entitled to return of capital in accordance with Article 146.

16. The Company may transfer as may be permitted by law, pay a commission to any person in consideration of his subscribing or agreeing to subscribe whether absolutely or conditionally for any shares. Such commissions may be satisfied by the payment of cash or the lodgement of fully or partly paid-up shares or partly in one way and partly in the other. The Company may also on any issue of shares pay such brokerage as may be lawful.

VARIATION OF RIGHTS ATTACHING TO SHARES

17. Subject to the provisions of these Articles, if at any time the share capital is divided into different classes of shares, the rights attaching to any class (unless otherwise provided by the terms of issue of the shares of that class) may be varied or abrogated with the consent in writing of the holders of two-thirds of the issued shares of that class, or with the sanction of a resolution passed by at least a two-thirds majority of the holders of shares of the class present in person or by proxy at a separate general meeting of the holders of the shares of the class. To every such separate general meeting the provisions of these Articles relating to general meetings of the Company shall mutatis mutandis apply, but so that the necessary quorum shall be at least one person holding or representing by proxy at least one-third of the issued shares of the class and that any holder of shares of the class present in person or by proxy may demand a poll.



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- 18. The rights conferred upon the holders of the shares of any class issued with preferred or other rights shall not, unless otherwise expressly provided by the terms of issue of the shares of that class, be deemed to be varied or abrogated by the creation or issue of further shares ranking pari passu therewith or the redemption or purchase of shares of any class by the Company.

CERTIFICATES

- 19. Every person whose name is entered as a member in the Register of Members shall, without payment, be entitled to a certificate in the form determined by the Directors. Such certificate may be under the Seal. All certificates shall specify the share or shares held by that person and the amount paid up thereon, provided that in respect of a share or shares held jointly by several persons the Company shall not be bound to issue more than one certificate, and delivery of a certificate for a share to one of several joint holders shall be sufficient delivery to all.
- 20. If a share certificate is defaced, lost or destroyed it may be renewed on such terms, if any, as to evidence and indemnity as the Directors think fit.

FRACTIONAL SHARES

- 21. The Directors may issue fractions of a share of any class of shares, and, if so issued, a fraction of a share (calculated to three decimal points) shall be subject to and carry the corresponding fraction of liabilities (whether with respect to any unpaid amount thereon, contribution, calls or otherwise), liabilities, preferences, privileges, qualifications, restrictions, rights (including, without limitation, voting and participation rights) and other attributes of a whole share of the same class of shares. If more than one fraction of a share of the same class is issued to or acquired by the same Member, then such fractions shall be accumulated.

LIEN

- 22. The Company shall have a first priority lien and charge on every partly paid share for all moneys (whether presently payable or not) called or payable at a fixed time in respect of that share, and the Company shall also have a first priority lien and charge on all partly paid shares standing registered in the name of a Member (whether held solely or jointly with another person) for all moneys presently payable by him or his estate to the Company, but the Directors may at any time declare any share to be wholly or in part exempt from the provisions of this Article. The Company's lien, if any, on a share shall extend to all distributions payable thereon.
- 23. The Company may sell, in such manner as the Directors in their absolute discretion think fit, any shares on which the Company has a lien, but no sale shall be made unless an amount in respect of which the lien exists is presently payable nor until the expiration of 14 days after a notice in writing, stating and demanding payment of such part of the amount in respect of which the lien exists as is presently payable, has been given to the registered holder for the time being of the share, or the persons entitled thereto by reason of his death or bankruptcy.
- 24. For giving effect to any such sale the Directors may authorise some person to transfer the share sold to the purchaser thereof. The purchaser shall be registered as the holder of the shares comprised in any such transfer and he shall not be bound to see to the application of the purchase money, nor shall his title to the shares be affected by any irregularity or invalidity in the proceedings in reference to the sale.
- 25. The proceeds of the sale after deduction of expenses, fees and commission incurred by the Company shall be received by the Company and applied in payment of such part of the amount in respect of which the lien exists as is presently payable, and the residue shall (subject to a lien for sums not presently payable as entered upon the shares prior to the sale) be paid to the person entitled to the shares at the date of the sale.



CALLS ON SHARES

- 26. The Directors may from time to time make calls upon the Members in respect of any moneys unpaid on their partly paid shares, and each Member shall (subject to receiving at least 14 days notice specifying the time or times of payment) pay to the Company at the time or times so specified the amount called on such shares.
- 27. The joint holders of a share shall be jointly and severally liable to pay calls in respect thereof.
- 28. If a sum called in respect of a share is not paid before or on the day appointed for payment thereof, the person from whom the sum is due shall pay interest upon the sum at the rate of eight per centum per annum from the day appointed for the payment thereof to the time of the actual payment but the Directors shall be at liberty to waive payment of that interest wholly or in part.
- 28. The provisions of these Articles as to the liability of joint holders and as to payment of interest shall apply in the case of non-payment of any sum which, by the terms of issue of a share, becomes payable at a fixed time, whether on account of the amount of the share, or by way of premium, as if the same had become payable by virtue of a call duly made and notified.
- 30. The Directors may make arrangements on the issue of partly paid shares for a difference between the Members, or the particular shares, in the amount of calls to be paid and in the times of payment.
- 31. The Directors may, if they think fit, receive from any Member willing to advance the same all or any part of the moneys uncalled and unpaid upon any partly paid shares held by him, and upon all or any of the moneys so advanced may (until the same would, but for such advance, become presently payable) pay interest at such rate (not exceeding without the sanction of an Ordinary Resolution, eight per cent, per annum) as may be agreed upon between the Member paying the sum in advance and the Directors.

FORFEITURE OF SHARES

- 32. If a Member fails to pay any call or instalment of a call in respect of partly paid shares on the day appointed for payment, the Directors may, at any time thereafter during such time as any part of such call or instalment remains unpaid, serve a notice on him requiring payment of so much of the call or instalment as is unpaid, together with any interest which may have accrued.
- 33. The notice shall name a further day (not earlier than the expiration of 14 days from the date of the notice) on or before which the payment required by the notice is to be made, and shall state that in the event of non-payment at or before the time appointed the shares in respect of which the call was made will be liable to be forfeited.
- 34. If the requirements of any such notice as aforesaid are not complied with, any share in respect of which the notice has been given may at any time thereafter, before the payment required by notice has been made, be forfeited by a resolution of the Directors to that effect.
- 35. A forfeited share may be sold or otherwise disposed of on such terms and in such manner as the Directors think fit, and at any time before a sale or disposition the forfeiture may be cancelled on such terms as the Directors think fit.
- 36. A person whose shares have been forfeited shall cease to be a Member in respect of the forfeited shares, but shall, notwithstanding, remain liable to pay to the Company all moneys which at the date of forfeiture were payable by him to the Company in respect of the shares forfeited, but his liability shall cease if and when the Company receives payment in full of the amount unpaid on the shares forfeited.



- 37. A statutory declaration in writing that the declarant is a Director, and that a share has been duly forfeited on a date stated in the declaration, shall be conclusive evidence of the facts in the declaration as against all persons claiming to be entitled to the share.
- 38. The Company may receive the consideration, if any, given for a share on any sale or disposition thereof pursuant to the provisions of these Articles as to forfeiture and may execute a transfer of the share in favour of the person to whom the share is sold or disposed of and that person shall be registered as the holder of the share, and shall not be bound to see to the application of the purchase money, if any, nor shall his title to the share be affected by any irregularity or invalidity in the proceedings in reference to its forfeiture, sale or disposal of the share.
- 39. The provisions of these Articles as to forfeiture shall apply in the case of non-payment of any sum which by the terms of issue of a share becomes due and payable, whether on account of the amount of the share, or by way of premium, as if the same had been payable by virtue of a call duly made and notified.

TRANSFER OF SHARES

- 40. The instrument of transfer of any share shall be in any usual or common form or such other form as the Directors may, in their absolute discretion, approve and be executed by or on behalf of the transferor and if in respect of a nil or partly paid up share, or if so required by the Directors, shall also be executed on behalf of the transferee, shall be accompanied by the certificate (if any) of the shares to which it relates and such other evidence as the Directors may reasonably require to show the right of the transferor to make the transfer. The transferee shall be deemed to remain a holder of the share until the name of the transferee is entered in the Register of Members in respect thereof.
- 41. The Directors shall decline to register any transfer of shares unless the proposed transferee, if not already a party to the Shareholders Agreement, has executed a Deed of Adherence. The Directors shall also decline to register any transfer of Class O Shares that is not in compliance with the terms of the Shareholders Agreement.
- 42. The registration of transfers may be suspended at such times and for such periods as the Directors may, in their absolute discretion, from time to time determine, provided always that such registration shall not be suspended for more than 45 days in any year.
- 43. All instruments of transfer which are registered shall be retained by the Company, but any instrument of transfer which the Directors decline to register shall (except in any case of fraud) be returned to the person depositing the same.

TRANSMISSION OF SHARES

- 44. The legal personal representative of a deceased sole holder of a share shall be the only person recognized by the Company as having any title to the share. In the case of a share registered in the name of two or more holders, the survivors or survivor, or the legal personal representatives of the deceased survivor, shall be the only person recognized by the Company as having any title to the share.
- 45. Any person becoming entitled to a share in consequence of the death or bankruptcy of a Member shall upon such evidence being produced as may from time to time be required by the Directors, have the right either to be registered as a Member in respect of the share or, instead of being registered himself, to make such transfer of the share as the deceased or bankrupt person could have made; but the Directors shall, in either case, have the same right to decline or suspend registration as they would have had in the case of a transfer of the share by the deceased or bankrupt person before the death or bankruptcy.



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

ALTERATION OF CAPITAL

- 47. The Company may from time to time by Ordinary Resolution increase the share capital by such sum, to be divided into shares of such classes and amount, as the resolution shall prescribe.
- 48. The Company may by Ordinary Resolution:
 - (a) consolidate and divide all or any of its share capital into shares of a larger amount than its existing shares;
 - (b) convert all or any of its paid up shares into stock and reconvert that stock into paid up shares of any denomination;
 - (c) subdivide its existing shares, or any of them into shares of a smaller amount provided that in the subdivision the proportion between the amount paid and the amount, if any, unpaid on each reduced share shall be the same as it was in case of the share from which the reduced share is derived;
 - (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 and diminish the amount of its share capital by the amount of the shares so cancelled.
- 49. The Company may by Special Resolution reduce its share capital and any capital redemption reserve in any manner authorized by law.

REDEMPTION AND PURCHASE OF OWN SHARES

- 50. Subject to the provisions of the Law, the Company may:
 - (a) issue shares on terms that they are to be redeemed or are liable to be redeemed at the option of the Company or the Member on such terms and in such manner as the Directors may, before the issue of such shares, determine;
 - (b) purchase its own shares (including any redeemable shares) on such terms and in such manner as the Directors may determine and agree with the Member; and
 - (c) make a payment in respect of the redemption or purchase of its own shares otherwise than out of profits or the proceeds of a fresh issue of shares.
- 51. Any share in respect of which notice of redemption has been given shall not be entitled to participate in the profits of the Company in respect of the period after the date specified as the date of redemption in the notice of redemption.
- 52. The redemption or purchase of any share shall not be deemed to give rise to the redemption or purchase of any other share.
- 53. The Directors may when making payments in respect of redemption or purchase of shares, if authorized by the terms of issue of the shares being redeemed or purchased or with the agreement of the holder of such shares, make such payment either in cash or in specie.



CLOSING REGISTER OF MEMBERS OR FIXING RECORD DATE

- 54. For the purpose of determining those Members that are entitled to receive notice of, attend or vote at any meeting of Members or any adjournment thereof, or those Members that are entitled to receive payment of any dividend, or in order to make a determination as to who is a Member for any other purpose, the Directors may provide that the Register of Members shall be closed for transfers for a stated period which shall not exceed in any case 40 days. If the Register of Members shall be so closed for the purpose of determining those Members that are entitled to receive notice of, attend or vote at a meeting of Members the register shall be so closed for at least 10 days (immediately preceding such meeting and the record date for such determination shall be the date of the closure of the Register of Members.
- 55. In lieu of or apart from closing the Register of Members, the Directors may fix in advance a date as the record date for any such determination of those Members that are entitled to receive notice of, attend or vote at a meeting of the Members and for the purpose of determining those Members that are entitled to receive payment of any dividend the Directors may, at or within 90 days prior to the date of declaration of such dividend fix a subsequent date as the record date for such determination.
- 56. If the Register of Members is not so closed and no record date is fixed for the determination of those Members entitled to receive notice of, attend or vote at a meeting of Members or those Members that are entitled to receive payment of a dividend, the date on which notice of the meeting is called or the date on which the resolution of the Directors declaring such dividend is adopted, as the case may be, shall be the record date for such determination of Members. Where a determination of those Members that are entitled to receive notice of, attend or vote at a meeting of Members has been made as provided in this Article, such determination shall apply to any adjournment thereof.

GENERAL MEETINGS

- 57. The Directors may, whenever they think fit, convene a general meeting of the Company.
- 58. General meetings shall also be convened on the written requisition of any Member or Members entitled to attend and vote at general meetings of the Company who hold not less than 10 per cent of the paid up voting share capital of the Company deposited at the registered office of the Company specifying the objects of the meeting for a date not later than 21 days from the date of deposit of the requisition signed by the requisitionists, and if the Directors do not convene such meeting for a date not later than 45 days after the date of such deposit, the requisitionists themselves may convene the general meeting in the same manner, as nearly as possible, as that in which general meetings may be convened by the Directors, and all reasonable expenses incurred by the requisitionists as a result of the failure of the Directors to convene the general meeting shall be reimbursed to them by the Company.
- 59. If at any time there are no Directors, any two Members (or if there is only one Member then that Member) entitled to vote at general meetings of the Company may convene a general meeting in the same manner as nearly as possible as that in which meetings may be convened by the Directors.

NOTICE OF GENERAL MEETINGS

- 60. At least seven days notice counting from the date service is deemed to take place as provided in these Articles specifying the place, the day and the hour of the meeting and, in case of special business, the general nature of that business, shall be given in the manner hereinafter provided or in such other manner (if any) as may be prescribed by the Company by Ordinary Resolution to such persons as are, under these Articles, entitled to receive such notices from the Company, but with the consent of all the Members entitled to receive notice of some particular meeting and



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shall and vote thereat, that meeting may be convened by such shorter notice or without notice and in such manner as those Members may think fit.

- 61. The accidental omission to give notice of a meeting to or the non-receipt of a notice of a meeting by any Member shall not invalidate the proceedings at any meeting.

PROCEEDINGS AT GENERAL MEETINGS

- 62. All business carried out at a general meeting shall be deemed special with the exception of sanctioning a dividend, the consideration of the accounts, balance sheets, and any report of the Directors or of the Company's auditors, the appointment and removal of Directors and the fixing of the remuneration of the Company's auditors. No special business shall be transacted at any general meeting without the consent of all Members entitled to receive notice of that meeting unless notice of such special business has been given in the notice convening that meeting.
- 63. 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 otherwise provided by these Articles, one or more of the Members holding more than 51% of the paid up voting share capital of the Company present in person or by proxy shall be a quorum.
- 64. If within half an hour from the time appointed for the meeting a quorum is not present, the meeting, if convened upon the requisition of Members, shall be dissolved. In any other case it shall stand adjourned to the same day in the next week, at the same time and place, and if at the adjourned meeting a quorum is not present within half an hour from the time appointed for the meeting the Member or Members present and entitled to vote shall be a quorum (except in relation to an adjournment to a general meeting concerning a Reserved Matter, for which the quorum shall be one or more of the Members present in person or by proxy who hold more than 51% of the outstanding issued Class G Shares of the Company).
- 65. If the Directors wish to make this facility available to Members for a specific or all general meetings of the Company, a Member may participate in any general meeting of the Company by means of a telephone or similar communication equipment by way of which all persons participating in such meeting can hear each other and such participation shall be deemed to constitute presence in person at the meeting.
- 66. The Chairman, if any, of the Board of Directors shall preside as Chairman at every general meeting of the Company.
- 67. If there is no such Chairman, or if at any general meeting he is not present within fifteen minutes after the time appointed for holding the meeting or is unwilling to act as Chairman, the Members present shall choose one of their number to be Chairman of that meeting.
- 68. The Chairman may with the consent of any general meeting at which a quorum is present (and shall if so directed by the meeting) adjourn a meeting from time to time and from place to place, but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting from which the adjournment took place. When a meeting is adjourned for 14 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.
- 69. 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 by one or more Members present in person or by proxy entitled to vote, and unless a poll is so demanded, a declaration by the Chairman that a resolution has, on a show of hands, been carried, or carried unanimously, or by a particular majority, or lost, and an entry to that effect in



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the book of the proceedings of the Company, shall be conclusive evidence of the fact, without proof of the number or proportion of the votes recorded in favour of, or against, that resolution.

- 70. If a poll is duly demanded it shall be taken in such manner as the Chairman directs, and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was demanded.
- 71. In the case of an equality of votes, whether on a show of hands or on a poll, the Chairman of the meeting at which the show of hands takes place or at which the poll is demanded, shall be entitled to a second or casting vote.
- 72. A poll demanded on the election of a Chairman of the meeting or on a question of adjournment shall be taken forthwith. A poll demanded on any other question shall be taken at such time as the Chairman of the meeting directs.

VOTES OF MEMBERS

- 73. Subject to any rights and restrictions for the time being attached to any class or classes of shares, on a show of hands every Member present in person and every person representing a Member by proxy shall at a general meeting of the Company have one vote and on a poll every Member and every person representing a Member by proxy shall have one vote for each share of which he or the person represented by proxy is the holder.
- 74. In the case of joint holders the vote of the senior who tenders a vote whether in person or by proxy shall be accepted to the exclusion of the votes of the joint holders and for this purpose seniority shall be determined by the order in which the names stand in the Register of Members.
- 75. A Member of unsound mind, or in respect of whom an order has been made by any court having jurisdiction in lunacy, may vote, whether on a show of hands or on a poll, by his committee, or other person in the nature of a committee appointed by that court, and any such committee or other person may vote by proxy.
- 76. No Member shall be entitled to vote at any general meeting unless all calls or other sums presently payable by him in respect of shares carrying the right to vote held by him have been paid.
- 77. On a poll votes may be given either personally or by proxy.
- 78. The instrument appointing a proxy shall be in writing under the hand of the appointor or of his attorney duly authorised in writing or, if the appointor is a corporation, either under Seal or under the hand of an officer or attorney duly authorised. A proxy need not be a Member.
- 79. An instrument appointing a proxy may be in any usual or common form or such other form as the Directors may approve.
- 80. The instrument appointing a proxy shall be deemed to confer authority to demand or join in demanding a poll.
- 81. A resolution in writing signed by all the Members for the time being entitled to receive notice of and to attend and vote at general meetings (or being corporations by their duly authorised representatives) shall be as valid and effective as if the same had been passed at a general meeting of the Company duly convened and held.

CORPORATIONS ACTING BY REPRESENTATIVES AT MEETINGS

- 82. Any corporation which is a Member or a Director 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 or of the Board of Directors or of a committee of Directors, and the person so authorised shall be entitled to exercise the same powers on behalf of the corporation which he represents as that corporation could exercise if it were an individual Member or Director.

DIRECTORS

- 83. The Board of Directors shall be comprised of ten Directors.
- 84. Abreej may appoint up to five Abreej Directors and remove from office any Abreej Director and appoint another in his place.
- 85. Al Jomaih may appoint up to three Al Jomaih Directors and remove from office any Al Jomaih Director and appoint another in his place.
- 86. Denham may appoint up to two Denham Directors and remove from office any Denham Director and appoint another in his place.
- 87. At any time that Abreej, Al Jomaih and Denham are entitled to vote for the election or removal of any of the Abreej, Al Jomaih or Denham Directors, they will not vote in favour of the removal of any of the Abreej, Al Jomaih or Denham Directors as the case may be.
- 88. A Member has the right to request another Member to remove a Director appointed by that Member for Cause. For purposes of this Article 88, Cause shall mean (a) such Director's conviction of a crime constituting a felony (b) gross negligence (as such term is construed under English law), willful misconduct or fraud on the part of a Director's conduct in connection with performance of his duties, or (c) disqualification of such Director to serve as a director of a company incorporated under the laws of the Cayman Islands.
- 89. The remuneration of the Directors may be determined by the Board of Directors or by the Company by Ordinary Resolution.
- 90. There shall be no shareholding qualification for Directors unless determined otherwise by the Company by Ordinary Resolution.

ALTERNATE DIRECTOR

- 91. Any Director may in writing appoint another person to be his alternate to act in his place at any meeting of the Directors at which he is unable to be present. Every such alternate shall be entitled to notice of meetings of the Directors and to attend and vote thereat as a Director when the person appointing him is not personally present and where he is a Director to have a separate vote on behalf of the Director he is representing in addition to his own vote. A Director may at any time in writing revoke the appointment of an alternate appointed by him. Such alternate shall not be an officer of the Company and shall be deemed to be the agent of the Director appointing him. The remuneration of such alternate shall be payable out of the remuneration of the Director appointing him and the proportion thereof shall be agreed between them.
- 92. Any Director may appoint any person, whether or not a Director, to be the proxy of that Director to attend and vote on his behalf, in accordance with instructions given by that Director, or in the absence of such instructions at the discretion of the proxy, at a meeting or meetings of the Directors which that Director is unable to attend personally. The instrument appointing the proxy shall be in writing under the hand of the appointing Director and shall be in any usual or common form or such other form as the Directors may approve, and must be lodged with the Chairman of the meeting of the Directors at which such proxy is to be used, or first used, prior to the commencement of the meeting.



POWERS AND DUTIES OF DIRECTORS

- 93. Subject to the provisions of the Law, these Articles and to any resolutions made in a general meeting, the business of the Company shall be managed by the Directors, who may pay all expenses incurred in setting up and registering the Company and may exercise all powers of the Company subject to any delegation of powers to service providers as contemplated in Article 152; provided that, the Directors shall not be entitled to act in relation to any Reserved Matter unless previously approved by Abraj, Al Jouath and Dentam.
- 94. The Directors may from time to time appoint any person, whether or not a Director to hold such office in the Company as the Directors may think necessary for the administration of the Company, including but not limited to, the office of president, one or more vice-presidents, treasurer, assistant treasurer, manager or controller, and for such term and at such remuneration (whether by way of salary or commission or participation in profits or partly in one way and partly in another), and with such powers and duties as the Directors may think fit. Any person so appointed by the Directors may be removed by the Directors. The Abraj Directors may also appoint one or more of their number to the office of managing director upon like terms, but any such appointment shall ipso facto determine if any managing director ceases from any cause to be a Director.
- 95. The Directors may appoint a Secretary (and it need be an Assistant Secretary or Assistant Secretaries) who shall hold office for such term, at such remuneration and upon such conditions and with such powers as they think fit. Any Secretary or Assistant Secretary so appointed by the Directors may be removed by the Directors.
- 96. The Directors may delegate any of their powers to committees consisting of such member or members of their body as they think fit; any committee so formed shall in the exercise of the powers so delegated conform to any regulations that may be imposed on it by the Directors.
- 97. The Directors may from time to time and at any time by power of attorney appoint any company, firm or person or body of persons, whether nominated directly or indirectly by the Directors, to be the attorney or attorneys of the Company for such purposes and with such powers, authorities and discretion (not exceeding those vested in or exercisable by the Directors under these Articles) and for such period and subject to such conditions as they may think fit, and any such power of attorney may contain such provisions for the protection and convenience of persons dealing with any such attorney as the Directors may think fit, and may also authorize any such attorney to delegate all or any of the powers, authorities and discretion vested in him.
- 98. The Directors may from time to time provide for the management of the affairs of the Company in such manner as they shall think fit and the provisions contained in the three next following Articles shall not limit the general powers conferred by this Article.
- 99. The Directors from time to time and at any time may establish any committees, local boards or agencies for managing any of the affairs of the Company and may appoint any persons to be members of such committees or local boards and may appoint any managers or agents of the Company and may fix the remuneration of any such persons.
- 100. The Directors from time to time and at any time may delegate to any such committee, local board, manager or agent any of the powers, authorities and discretions for the time being vested in the Directors and may authorize the members for the time being of any such local board, or any of them to fill 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, but no person dealing in good faith and without notice of any such annulment or variation shall be affected thereby.



101. Any such delegates as aforesaid may be authorized by the Directors to subdelegate all or any of the powers, authorities, and discretion for the time being vested in them

BORROWING POWERS OF DIRECTORS

102. The Directors may exercise all the powers of the Company to borrow money and to mortgage or charge its undertaking, property and uncalled capital or any part thereof, to issue debentures, debenture stock and other securities whenever money is borrowed or as security for any debt, liability or obligation of the Company or of any third party.

DISQUALIFICATION OF DIRECTORS

103. The office of Director shall be vacated, if the Director:

- (a) becomes bankrupt or makes any arrangement or composition with his creditors;
- (b) is found to be or becomes of unsound mind;
- (c) resigns his office by notice in writing to the Company;
- (d) is removed from office by Special Resolution; or
- (e) is in the case of an Abmaaj Director, Al Jomaih Director and Darham Director, removed from office by Abmaaj, Al Jomaih or Darham respectively.

PROCEEDINGS OF DIRECTORS

104.

- (a) The Directors may meet together (either within or without the Cayman Islands) for the despatch of business, adjourn, and otherwise regulate their meetings and proceedings as they think fit. Any Director shall have the right to require the Chairman to convene a meeting of the Board. Notwithstanding the foregoing, at least 4 meetings shall take place annually, except that no such meetings shall take place unless the date and time of such meeting has been approved by Abmaaj. Questions arising at any meeting shall be decided by a majority of votes. In the case of an equality of votes the Chairman shall have a second or casting vote. A Director may, and a Secretary or Assistant Secretary on the requisition of a Director shall require the Chairman to convene a meeting of the Directors.
- (b) At least ten Business days notice of each meeting of the Board shall be given to the Directors.
- (c) An agenda and copies of any appropriate supporting papers shall be sent to each Director not later than five Business days prior to the date of each board meeting.

105. A Director or Directors may participate in any meeting of the Board of Directors, or of any committee appointed by the Board of Directors of which such Director or Directors are members, by means of telephone, video conferencing or similar communication equipment by way of which all persons participating in such meeting can hear each other and if he so wishes, to address all other participating Directors simultaneously and such participation shall be deemed to constitute presence in person at the meeting. All meetings shall be conducted in English.

106. The quorum necessary for the transaction of meetings of the Directors shall be five Directors of which a majority shall be Abmaaj Directors and at least one Director appointed by each of A/



Journals and Minutes (but only for so long as such party is a Shareholder). A Director represented by proxy or by an Alternate Director at any meeting shall be deemed to be present for the purposes of determining whether or not a quorum is present. If a quorum is not present within 30 minutes of the allotted commencement time, the meeting shall be adjourned until the same time on 5th Business Day after initial meeting date at which time the quorum shall consist of any 5 Directors.

- 107. A Director who is in any way, whether directly or indirectly, interested in a contract or proposed contract with the Company shall declare the nature of his interest at a meeting of the Directors. A general notice given to the Board of Directors by any Director to the effect that he is a member of any specified company or firm and is to be regarded as interested in any contract which may hereafter be made with that company or firm shall be deemed a sufficient declaration of interest in regard to any contract so made. A Director may vote in respect of any contract or proposed contract or arrangement notwithstanding that he may be interested therein and if he does so his vote shall be counted and he may be counted in the quorum at any meeting of the Directors at which any such contract or proposed contract or arrangement shall come before the meeting for consideration.
- 108. A Director may hold any other office or place of profit under the Company (other than the office of auditor) in conjunction with his office of Director for such period and on such terms (as to remuneration and otherwise) as the Directors may determine and no Director or intending Director shall be disqualified by his office from contracting with the Company either with regard to his tenure of any such other office or place of profit or as vendor, purchaser or otherwise, nor shall any such contract or arrangement entered into by or on behalf of the Company in which any Director is in any way interested, be liable to be avoided, nor shall any Director so contracting or being so interested be liable to account to the Company for any profit realized by any such contract or arrangement by reason of such Director holding that office or of the fiduciary relation thereby established. A Director, notwithstanding his interest, may be counted in the quorum present at any meeting of the Directors whereat he or any other Director is appointed to hold any such office or place of profit under the Company or whereat the terms of any such appointment are arranged and he may vote on any such appointment or arrangement.
- 109. Any Director may act by himself or his firm in a professional capacity for the Company, and he or his firm shall be entitled to remuneration for professional services as if he were not a Director; provided that nothing herein contained shall authorize a Director or his firm to act as auditor to the Company.
- 110. The Directors shall cause minutes to be made in books or loose-leaf folders provided for the purpose of recording:
 - (a) all appointments of officers made by the Directors;
 - (b) the names of the Directors present at each meeting of the Directors and of any committee of the Directors;
 - (c) all resolutions and proceedings at all meetings of the Company, and of the Directors and of committees of Directors;
- 111. Minutes of each Board meeting written in English shall be circulated to each Director no later than 10 Business Days after the relevant meeting.
- 112. When the Chairman of a meeting of the Directors signs the minutes of such meeting those minutes shall be deemed to have been duly held notwithstanding that all the Directors have not actually come together or that there may have been a technical defect in the proceedings. Notwithstanding the foregoing, minutes of each meeting shall be written in English and shall be circulated to each Director no later than ten Business days after the relevant meeting.



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- 113. A resolution signed by all the Directors shall be as valid and effectual as if it had been passed at a meeting of the Directors duly called and constituted. When signed a resolution may consist of several documents each signed by one or more of the Directors.
- 114. The continuing Directors may act notwithstanding any vacancy in their body but if and so long as their number is reduced below the number fixed by or pursuant to these Articles as the necessary quorum of Directors, the continuing Directors may act for the purpose of increasing the number, or of summoning a general meeting of the Company, but for no other purpose.
- 115. The Chairman of the Board shall be such Director as may from time to time be nominated by the Board.
- 116. A committee appointed by the Directors may elect a Chairman of its meetings. If no such Chairman is elected, or if at any meeting the Chairman is not present within five minutes after the time appointed for holding the meeting, the members present may choose one of their number to be Chairman of the meeting.
- 117. A committee appointed by the Directors may meet and adjourn as it thinks proper. Questions arising at any meeting shall be determined by a majority of votes of the committee members present and in case of an equality of votes the Chairman shall have a second or casting vote.
- 118. All acts done by any meeting of the Directors or of a committee of Directors, or by any person acting as a Director, shall notwithstanding that it be afterwards discovered that there was some defect in the appointment of any such Director or person acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a Director.
- 118. (Not used)

DIVIDENDS

- 120. Subject to Article 15(a) and any rights and restrictions for the time being attached to any class or classes of shares, the Directors may from time to time declare dividends (including interim dividends) and other distributions on shares in issue and authorize payment of the same out of the funds of the Company lawfully available therefor.
- 121. Subject to Article 15(a) and any rights and restrictions for the time being attached to any class or classes of shares, the Company by Ordinary Resolution may declare dividends, but no dividend shall exceed the amount recommended by the Directors.
- 122. The Directors may, before recommending or declaring any dividend, set aside out of the funds legally available for distribution such sums as they think proper as a reserve or reserves which shall, in the absolute discretion of the Directors be applicable for meeting contingencies, or for equalizing dividends or for any other purpose to which those funds may be properly applied and pending such application may in the absolute discretion of the Directors, either be employed in the business of the Company or be invested in such investments as the Directors may from time to time think fit.
- 123. Any dividend may be paid by cheque sent through the post to the registered address of the Member or person entitled thereto, or in the case of joint holders, to any one of such joint holders at his registered address or to such person and such address as the Member or person entitled, or such joint holders as the case may be, may direct. Every such cheque shall be made payable to the order of the person to whom it is sent or to the order of such other person as the Member or person entitled, or such joint holders as the case may be, may direct.



- 124. The Directors when paying dividends to the Members in accordance with the provisions of these Articles may make such payment either in cash or in specie.
- 125. Subject to any rights and restrictions for the time being attached to any class or classes of shares, all dividends shall be declared and paid according to the amounts paid on the shares, but if and so long as nothing is paid up on any of the shares dividends may be declared and paid according to the par value of the shares. No amount paid on a share in advance of calls shall, while carrying interest, be treated for the purposes of this Article as paid on the share.
- 126. If several persons are registered as joint holders of any share, any of them may give effectual receipts for any dividend or other moneys payable on or in respect of the share.
- 127. No dividend shall bear interest against the Company.
- 128. No dividend shall be paid otherwise than out of profits or, subject to the restrictions of the Law, the share premium account.

ACCOUNTS AND AUDIT

- 129. The books of account relating to the Company's affairs shall be kept in such manner as may be determined from time to time by the Directors.
- 130. The books of account shall be kept at the registered office of the Company, or at such other place or places as the Directors think fit, and shall always be open to the inspection of the Directors.
- 131. 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 Members not being Directors, and no Member (not being a Director) shall have any right of inspecting any account or book or document of the Company except as conferred by law or authorized by the Directors or by the Company by Ordinary Resolution.
- 132. The management accounts relating to the Company's affairs shall be provided to the holders of the Class O Shares within 30 days of each Quarter End Date and the Company's financial statements shall be audited annually and provided to each Shareholder as soon as they are available but in any event within 120 days of the relevant Financial Year End.

CAPITALISATION OF PROFITS

- 133. Subject to the Law, the Directors may, with the authority of an Ordinary Resolution:
 - (a) resolve to capitalise an amount standing to the credit of reserves (including a share premium account, capital redemption reserve and profit and loss account), whether or not available for distribution;
 - (b) appropriate the sum resolved to be capitalised to the Members in proportion to the nominal amount of Shares (whether or not fully paid) held by them respectively and apply that sum on their behalf to or towards:
 - (i) paying up the amounts (if any) for the time being unpaid on shares held by them respectively, or
 - (ii) paying up in full unissued shares or debentures of a nominal amount equal to that sum,



and all the shares or debentures, credited as fully paid, to the Members (or as they may direct) in those proportions, or partly in one way and partly in the other, but the share premium account, the capital redemption reserve and profits which are not available for distribution may, for the purposes of this Article, only be applied in paying up unissued shares to be allotted to Members credited as fully paid;

- (c) make any arrangements they think fit to resolve a difficulty arising in the distribution of a capitalised reserve and in particular, without limitation, where shares or debentures become distributable in fractions the Directors may deal with the fractions as they think fit;
- (d) authorise a person to enter (on behalf of all the Members concerned) into an agreement with the Company providing for either:
 - (i) the allotment to the Members respectively, credited as fully paid, of shares or debentures to which they may be entitled on the capitalisation, or
 - (ii) the payment by the Company on behalf of the Members (by the application of their respective proportions of the reserves resolved to be capitalised) of the amounts or part of the amounts remaining unpaid on their existing shares,

and any such agreement made under this authority being effective and binding on all those Members; and

- (e) generally do all acts and things required to give effect to the resolution.

SHARE PREMIUM ACCOUNT

- 134. The Directors shall in accordance with the Law establish a share premium account and shall carry to the credit of such account from time to time a sum equal to the amount or value of the premiums paid on the issue of any shares.
- 135. There shall be debited to any share premium account on the redemption or purchase of a share the difference between the nominal value of such share and the redemption or purchase price provided always that at the discretion of the Directors such sum may be paid out of the profits of the Company or, if permitted by the Law, out of capital.

NOTICES

- 136. Any notice or document may be served by the Company or by the person entitled to give notice to any Member either personally, by facsimile or by sending it through the post in a prepaid letter or via a recognised courier service, fees prepaid, addressed to the Member at his address as appearing in the Register of Members. In the case of joint holders of a share, no notice shall be given to that one of the joint holders whose name stands first in the Register of Members in respect of the joint holding, and notice so given shall be sufficient notice to all the joint holders.
- 137. Any Member present, either personally or by proxy, at any meeting of the Company shall for all purposes be deemed to have received due notice of such meeting and, where requisite, of the purposes for which such meeting was convened.
- 138. Any notice or other document, if served by (a) post, shall be deemed to have been served five days after the time when the letter containing the same is posted, or, (b) facsimile, shall be deemed to have been served upon production by the transmitting facsimile machine of a report confirming transmission of the facsimile in full to the facsimile number of the recipient or (c) recognised courier service, shall be deemed to have been served 48 hours after the time when the letter containing the same is delivered to the courier service. In proving service by post or



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courier service it shall be sufficient to prove that the letter containing the notice or documents was properly addressed and duly posted or delivered to the courier service.

- 139. Any notice or document delivered or sent by post to or left at the registered address of any Member in accordance with the terms of these Articles shall notwithstanding that such Member be then dead or bankrupt, and whether or not the Company has notice of his death or bankruptcy, be deemed to have been duly served in respect of any share registered in the name of such Member as sole or joint holder, unless his name shall at the time of the service of the notice or document, have been removed from the Register of Members as the holder of the share, and such service shall for all purposes be deemed a sufficient service of such notice or document on all persons interested (whether jointly with or as claiming through or under him) in the share.
- 140. Notice of every general meeting of the Company shall be given to:
 - (a) all Members holding shares with the right to receive notice and who have supplied to the Company an address for the giving of notices to them; and
 - (b) every person entitled to a share in consequence of the death or bankruptcy of a Member, who but for his death or bankruptcy would be entitled to receive notice of the meeting.

No other person shall be entitled to receive notices of general meetings.

INDEMNITY

- 141. Every Director (including for the purposes of this Article any alternate Director appointed pursuant to the provisions of these Articles), Secretary, Assistant Secretary, or other officer for the time being and from time to time of the Company (but not including the Company's auditors) and the personal representatives of the same shall be indemnified and secured harmless out of the assets and funds of the Company against all actions, proceedings, costs, charges, expenses, losses, damages or liabilities incurred or sustained by him in or about the conduct or purported conduct of the Company's business or affairs or in the execution or discharge or purported execution or discharge of his duties, powers, authorities or discretions, including without prejudice to the generality of the foregoing, any costs, expenses, losses or liabilities incurred by him in defending (whether successfully or otherwise) any civil proceedings concerning the Company or its affairs in any court whether in the Cayman Islands or elsewhere.
- 142. This indemnity shall not apply to any liability to the extent that it is recovered from any other person and is subject to such Director taking reasonable steps to effect such a recovery, to the extent that the indemnity shall not apply where any alternative right of recovery is available and capable of being enforced.
- 143. No such Director, alternate Director, Secretary, Assistant Secretary or other officer of the Company (but not including the Company's auditors) shall be liable (a) for the acts, receipts, neglects, defaults or omissions of any other such Director or officer or agent of the Company or (b) for any loss on account of defect of title in any property of the Company or (c) on account of the insufficiency of any security in or upon which any money of the Company shall be invested or (d) for any loss incurred through any bank, broker or other similar person or (e) for any loss occasioned by any negligence, default, breach of duty, breach of trust, error of judgement or oversight on his part or (f) for any loss, damage or misfortune whatsoever which may happen in or arise from the execution or discharge of the duties, powers, authorities, or discretions of his office or in relation thereto, unless the same shall happen through his own dishonesty.

NON-RECOGNITION OF TRUSTS

- 144. No person shall be recognised by the Company as holding any share upon any trust and the Company shall not, unless required by law, be bound by or be compelled in any way to recognise



(even when having notice thereof) any equitable, contingent or future interest in any of its shares or any other rights in respect thereof except an absolute right to the entirety thereof in each Member registered in the Register of Members. Notwithstanding the foregoing, the Company shall be entitled to recognize any such interests as shall be determined by the Directors in their absolute discretion.

WINDING-UP

- 145. The Company shall be taken to have commenced a voluntary winding up and dissolution upon the passing of a Special Resolution of the holders of the Class D Shares to wind up, dissolve, liquidate and terminate the Company.
- 146. If the Company shall be wound up, the liquidator shall apply:
 - (a) all the assets of the Company:
 - (i) first in paying the costs and expenses of the winding up, liquidation and dissolution of the Company;
 - (ii) secondly, to the creditors of the Company, in the order of priority provided by law;
 - (iii) thirdly, to establish reserves adequate to meet any and all contingent, unliquidated liabilities or obligations of the Company, provided that at the expiration of a period not exceeding three years after the final liquidation distribution, the balance of such reserves remaining after the payment of such contingencies or liabilities shall be distributed in the manner described herein;
 - (b) thereafter, all of the remaining assets of the Company, to the Class D Shareholders in proportion to the capital paid up on the Class D Shares held by each such Member at the commencement of the winding up.

AMENDMENT OF ARTICLES OF ASSOCIATION

- 147. Subject to the Law and the rights attaching to the various classes of shares, the Company may at any time and from time to time by Special Resolution alter or amend these Articles in whole or in part.

REGISTRATION BY WAY OF CONTINUATION

- 148. The Company may by Special Resolution resolve to be registered by way of continuation in a jurisdiction outside the Cayman Islands or such other jurisdiction in which it is for the time being incorporated, registered or existing. In furtherance of a resolution adopted pursuant to this Article, the Directors may cause an application to be made to the Registrar of Companies to deregister the Company in the Cayman Islands or such other jurisdiction in which it is for the time being incorporated, registered or existing and may cause all such further steps as they consider appropriate to be taken to effect the transfer by way of continuation of the Company.

THE SEAL

- 149. The Seal shall not be affixed to any instrument except by the authority of a resolution of the Board of Directors provided always that such authority may be given prior to or after the affixing of the Seal and if given after may be in general form confirming a number of affixings of the Seal. The Seal shall be affixed in the presence of a Director or a Secretary (or an Assistant Secretary) or in the presence of any one or more persons as the Directors may appoint for the purpose and every person as aforesaid shall sign every instrument to which the Seal is so affixed in their presence.



- 150. The Company may maintain a facsimile of the Seal in such countries or places as the Directors may appoint and such facsimile Seal shall not be affixed to any instrument except by the authority of a resolution of the Board of Directors provided always that such authority may be given prior to or after the affixing of such facsimile Seal and if given after may be in general terms conferring a number of affixings of such facsimile Seal. The facsimile Seal shall be affixed in the presence of such person or persons as the Directors shall for this purpose appoint and such person or persons as aforesaid shall sign every instrument to which the facsimile Seal is so affixed in their presence and such affixing of the facsimile Seal and signing as aforesaid shall have the same meaning and effect as if the Seal had been affixed in the presence of and the instrument signed by a Director or a Secretary (or an Assistant Secretary) or in the presence of any one or more persons as the Directors may appoint for the purpose.
- 151. Notwithstanding the foregoing, a Secretary or any Assistant Secretary shall have the authority to affix the Seal, or the facsimile Seal, to any instrument for the purpose of attesting authenticity of the matter contained therein but which does not create any obligation binding on the Company.

SERVICE PROVIDERS

- 162. The Directors may appoint any one or more Persons to act as service providers to the Company (including, without limitation to act as manager, administrator, custodian, Investment Manager, investment adviser, sponsor and/or prime broker to the Company) and the Directors may entrust to and confer upon such Persons any of the powers exercisable by them as Directors upon such terms and conditions including the right to remuneration payable by, and indemnification from, the Company and with such restrictions and with such powers of delegation as they may determine and either collaterally with or to the exclusion of their own powers.

CERTIFIED TO BE A TRUE AND CORRECT COPY
 SIGNED: MELANIE E. RIVERS WOODS
 Assistant Registrar
 Date: 30 June 2009



Annex I**Details of the technical and financial expertise and resources available for carrying on the relevant regulated activities**

The required gas transmission line is for supply of fuel to the Applicant's own power plants.

The Applicant has a combined installed capacity of 2,267 MW with network spanning 6,500 sq km and customer base of 2.5 million.

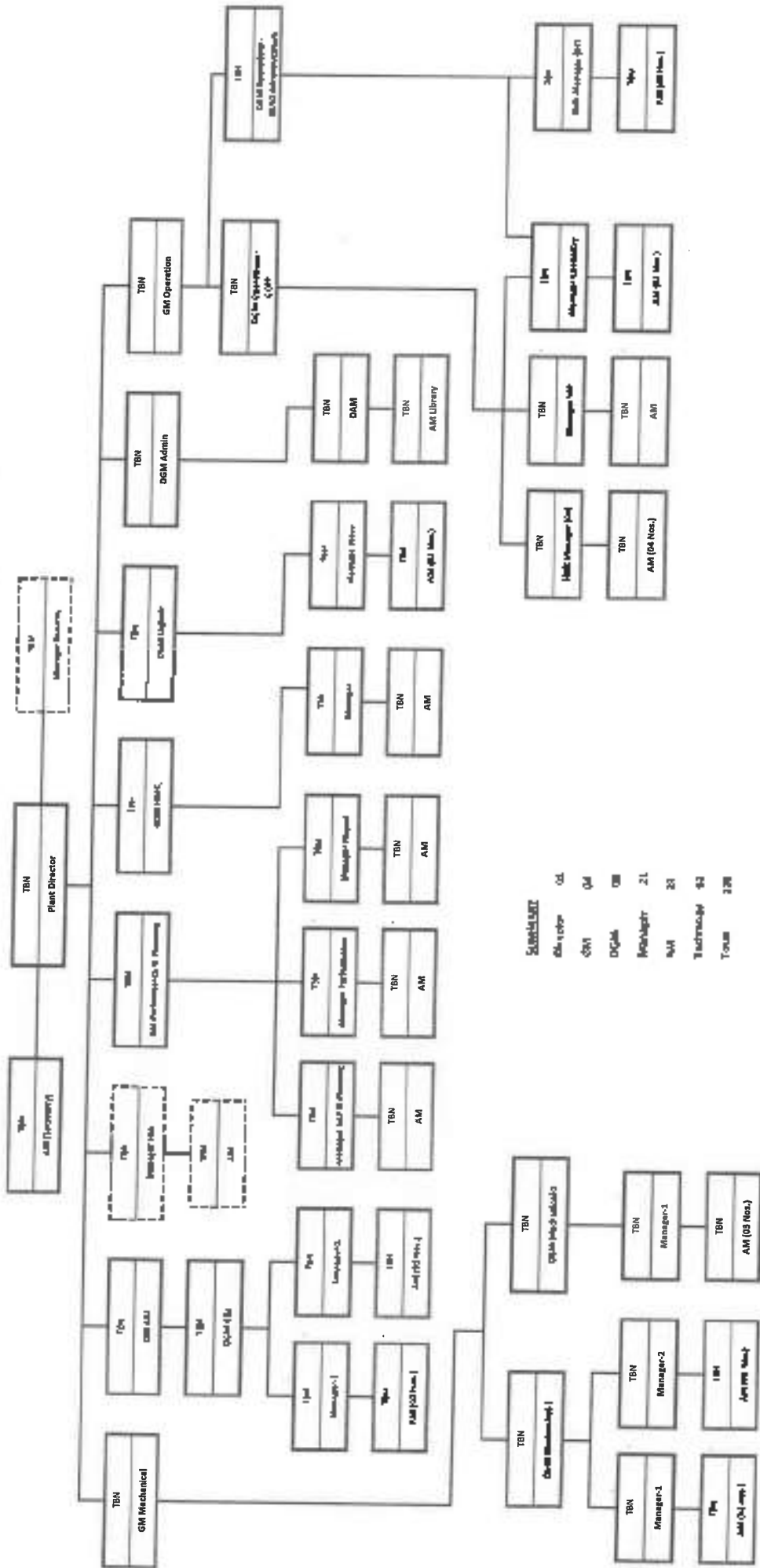
The Applicant has experience in managing large infrastructure projects, including extensive pipeline networks to delivery fuel safely to its facilities. It operates and maintains multiple gas receiving facilities and associated pipelines ranging from 20MMCFD to 300MMCFD capacity for transportation and supply of natural gas to power generation units situated at various locations in Karachi city. The applicant has engaged contractors previously in the safe implementation of EPC contracts for above mentioned power plants, such as Harbin Electrical International Company Limited (HEI) for 560MW CCPP which includes gas compressing stations and is in operation since 2012, METKA for 247 Combined Cycle Power Plant at Korangi, Black and Veatch and others for 1260MW Thermal Power Plant.

The Applicant has recently engaged HEI/Siemens as EPC Contractor for KE's flagship 900MW CCPP Project. The EPC scope also includes Gas Pressure Reduction System for RLNG, to be received at 85barg, the basic design of which has been facilitated by ENAR Petrotech Services Pvt. Ltd. This Gas Infrastructure is one of its kind for handling high pressure RLNG and includes installation of Gas Metering, Gas Heaters, Gas Pressure Reduction Skid, Analyzers and allied pipeline system.

The Applicant has invested over USD 2.4 billion across the energy value chain between 2009 to 2019 and in the last three years alone, nearly USD 1 billion. The financial statements herewith provided demonstrate the Applicant's robust financial resources and indicative of its broad expertise is as follows:

- (i) **Technical team:** The Applicant has a multi-disciplinary team of engineers capable of undertaking any project from implementation to operation. The Applicant and its team have successfully self-managed projects in excess of Rs.1 billion, including 1260MW Bin Qasim Thermal Power Plant, 560MW Combined Cycle Power Plant, 247MW Korangi Combined Cycle Power Plant, 100MW Site Gas Turbine Combined Cycle Power Plant.
- (ii) **Operation and maintenance:** Successful operation and maintenance of above mentioned power plants and associated gas infrastructures as demonstrated by managing electricity generation and distribution facilities, the Applicant's O&M teams are unparalleled.
- (iii) **Project and business management:** The Applicant has handled the setting up, upgrading and developing facilities requiring excellent procurement and project management resources to ensure its projects are timely concluded.

Proposed Organogram for SOCOMW BOPIS-III Project and RULING INFRASTRUCTURE (O&M teams)



B6
Amended J

Annex J

Details of the resources and expertise available to handle emergency situations arising out of natural calamities, accidental or criminal acts or omissions, specifying which such resources are available and which are to be procured.

The Applicant is successfully managing pipelines since for the last 30 years to supply fuel to its electricity generating facilities. The pipeline is designed in accordance with international standards and to withstand natural calamities including earthquake and flood etc. The major portion of pipeline will be underground and inherently safe from natural calamities. As regards protection against criminal acts, the pipeline is to run within the lands of the PQA which are secured. Additionally, the Applicant will have in-place various security regimes collaborated with multiple security contractors to reinforce the safety and security of its installations.

The Applicant is committed to maintain a high state of emergency preparedness, including conducting regular vulnerability assessments, regular reviewing and revising policies and procedures, providing prepositioned emergency response resources and routinely testing and evaluating emergency response procedure.

In responding to major emergencies priority will always be placed on preventing or minimizing harm or injury to individuals and the adverse effects of emergency.

The Applicant maintains following resources as minimum at all of its facilities to proactively handle any emergency situation and same is planned for the proposed facility:

1. Plant emergency trip systems with remote emergency shutdown capability
2. Site emergency siren
3. Hotline / emergency communication system
4. Onsite Emergency Response Team (ERT) consisting of trained operational, HSE & maintenance staff
5. Emergency & Safety Equipment
6. Onsite firefighting system
7. Onsite Medical Facility
8. Integral Security – well armed, highly trained ex-army servicemen
9. Mutual Assistance from neighboring companies/government agencies.
10. Emergency Management Plan – This procedure is intended to reflect the basic response of individuals should be taken in the most common emergencies (fire, explosions, etc) likely to be experienced at the plants and to define the management model to be employed when company employees must respond to major emergencies of all types

The EPC contractor shall prepare an Emergency Response Plans specific to the transmission line.

BT

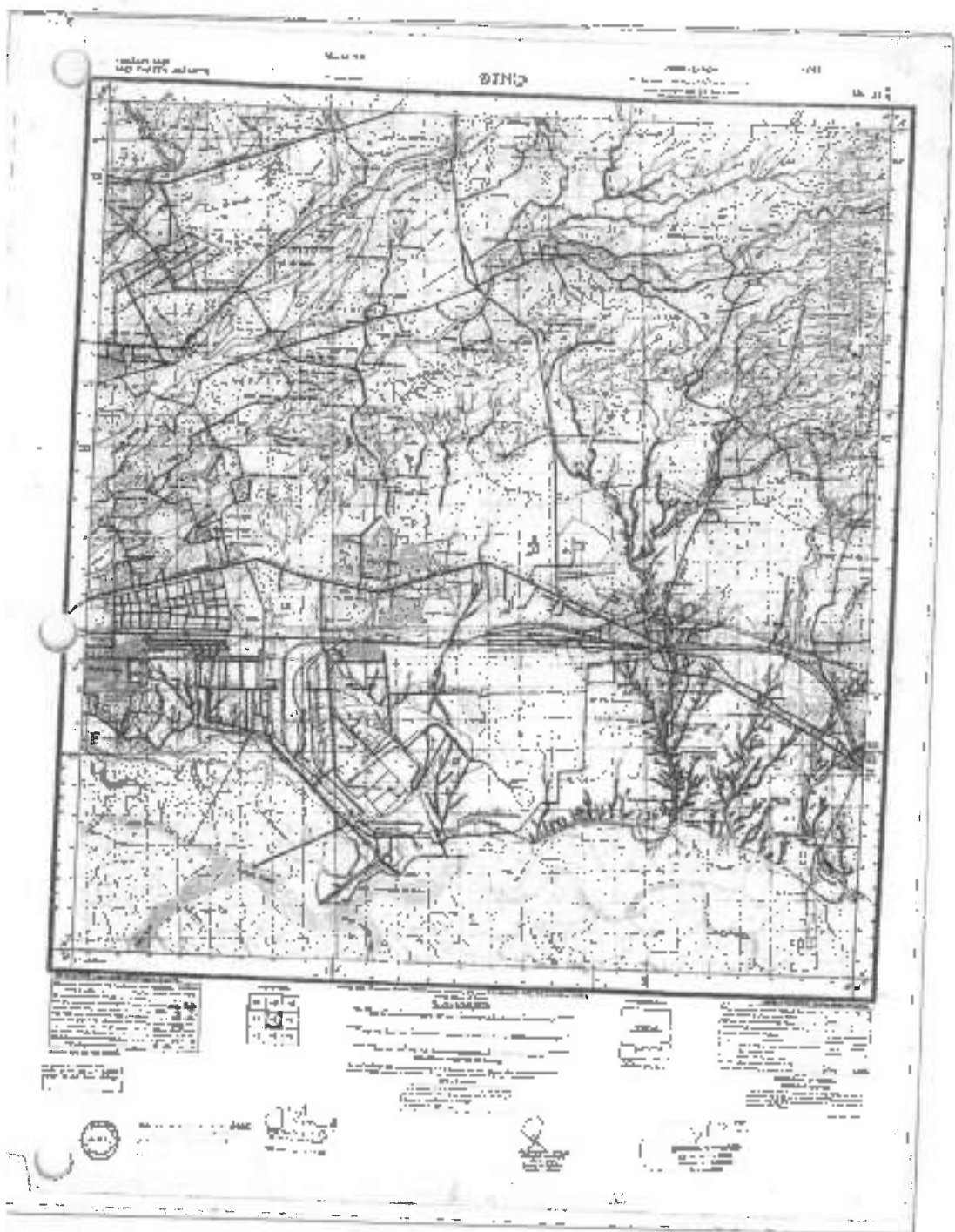
Annex K

List of Senior Management

In all cases the business addresses are: KE House, 39-B, Sunset Boulevard, DHA Phase II, Karachi.

S.No.	Name	Designation	Department
1	Syed Moonis Abdullah Alvi	Chief Executive Officer	CEO Secretariat
2	M. Rizwan Dalia	Chief People Officer	Human Resources
3	Muhammad Aamir	Chief Financial Officer	Finance
4	Dale Roger Sinkler	Chief Generation & Transmission Officer	Group Head Office
5	Mahreen Aziz Khan	Chief Marketing & Communication Officer	Marketing & Communication
6	Naz Khan	Chief Strategy Officer	Strategy
7	Tahir Ali Khan	Director L-2	BQPS-II
8	Pervez Musani	Director	Taxation & Insurance
9	Asif Raza	Chief Internal Auditor	Internal Audit
10	Muhammad Ali	Director	Business Finance G&T & Others
11	Muhammad Owais	Director BF & RM	Revenue Budget & Receivable Monitoring
12	Ahsan Anis	Head of Strategy & Comm. Planning L-2	Business Strategy
13	Zehra Aneek	Director	ESG & Sustainability
14	Mustafa Kamal	Director	Business Finance G&T & Others
15	M. Adrian Ali Rizwi	Director L-2	Business Development
16	Kamran Hashmi	Director New Connections	Energy Planning & Above 50 NC
17	Aamir Rizwan Qureshi	Director	Business Development
18	M. Bilal Ahmed Mirza	Director	Project Implementation
19	Arshad Iftikhar	Head of Distr Projects & Coordination	Distribution Strategy & Planning
20	Abdul Saleem	Director Grid System Maintenance	Grid System Maintenance
21	Ayaz Jaffar Ahmed	Director	Regulatory Affairs
22	Imdad Afzal	Head of Supply Chain	SCM Office
23	Abbas Husain Siahwala	Deputy Chief Gen & Trans Officer	Generation & Transmission
24	Rizwan Peşnani	Head of Treasury & Corp Finance	Treasury
25	Farooq Niaz	Director G&T and Enabling Functions	HRBP Generation & Transmission
26	Jamil A Bajwa	Director Employee Relations	Employee Relations
27	Muhammad Faizan Mahmood Khan	Chief of Information Technology	CIO Office
28	Razaq Ahmad Anjum	Director L-2	BQPS I
29	Hammad Khafid	Director People Services	People Services
30	Syed Irtan Ali Shah	Head of Legal Affairs	Legal Affairs
31	Inamullah Siddiqui	Director IT	Enterprise Business Support
32	Aadil Riaz	Lead HRBP - Distribution	HRBP Distribution
33	Haris Jamil Siddiqui	Director Public Affairs & Govt. Relations	Public Affairs & Govt. Relations
34	Rehan Sajjad	Head of Corporate HSEQ	Corporate HSEQ
35	Rana M. Imran	Director Corp. Communications	Corporate Communication

Amuletto L B
BB



DRAWING ON GEOGRAPHIC (30m x 45m) (Longitude)


ADDITIONAL
 LOCATION - CAROLAMBUK
 DATE - 15/12/87
 PERMANENT - KAD. 030410
 PARALLEL - 031 10 30 S

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K-ELECTRIC LIMITED			
 K-ELECTRIC (PK) LTD. 25, JALAN KEMAS, KUALA LUMPUR, MALAYSIA. TEL: 616 411 2211	DRAWING NO. 30-107-87 SHEET 2		
	25, JALAN KEMAS, KUALA LUMPUR, MALAYSIA. TEL: 616 411 2211		
PK	PROJECT	DATE	BY
		15/12/87	A.B.



K-ELECTRIC LIMITED Electrical Engineering (Pty) Ltd 100-102 Main Road, Durban, Natal Tel: 031 261 1111		OVER NO 100-102/103 10/11/12
DRAWING NO 100-102/103 10/11/12	DATE 10/11/12	SCALE 1:1000
PROJECT NO 100-102/103 10/11/12	CLIENT 100-102/103 10/11/12	DRAWN BY 100-102/103 10/11/12
CHECKED BY 100-102/103 10/11/12	APPROVED BY 100-102/103 10/11/12	DATE 10/11/12

Annotation "M"

91

Pakistan LNG Ltd. (PLU) shall supply 150MMCF/D RING at 85 barg with following specifications range

Ref.	Characteristics	Unit of Measurement	Limits
1	Higher Heating Value	BTU/SCF	947.6-1140
2	Wobbe Index	BTU/SCF	1292-1435
3	Inert Gases, Total	% vol/vol	4 max
4	Carbon dioxide	% vol/vol	2 max
5	Oxygen	% vol/vol	0.2 max
6	Hydrogen Sulphide	mg/m ³	5.49 max
7	Total Sulphur	mg/m ³	35 max
8	Hydrocarbon Dew Point	°C	-4 max at 5500 kPa abs
9	Total Mercury	µg/Nm ³	0


Approved "N" 92

	K-Electric - Generation - Bin Qasim 2270 MW Power Generation Complex PQA, Karachi			
	HSEQ Department - HSE Plan for 2 KM RLMG Line		Doc No.	RE-Gen-BQPS HSEQ-001-2020
	Version: 00		Page	Page 1 of 32
			Dated	15 th Jan 2020

KE Bin Qasim Re Liquefied Natural Gas Pipeline Project - HSE Plan

Rev No.	Author(s)/Initiated by	Revision History	
		Revision Date	Description/Details of Change
00	Zahid Faqir, DGM HSEQ Level - II, BQPS-III - 900 MW RLMG CCPP & Associated Grids Project	15 th Jan, 2020	Original Issue

	Review Matrix	
	Name / Designation	Signature
Changes/ Initiated by	Zahid Faqir DGM HSEQ	
Reviewed by	Syed Imran Ali DD Planning & Contracts	
Ratified by	Ameer Iqbal GM Mechanical	
Approved by	Tahir Ali Khan Director Level II, BQPS Complex	

	K-Electric - Generation - Bin Qasim 2270 MW Power Generation Complex POA, Karachi		
	HSEQ Department - HSE Plan for 2 KM RLNG Line		Doc No. ME-Gen-BCPS HSEQ-001-2020
	Version: 00	Page	Page 2 of 32
	Dated	15 th Jan 2020	

1. **Purpose of this document.** To establish a baseline document for ensuring safety during and after laying of a 2 KM long RLNG Pipeline in Port Qasim Region Karachi between SSGC RLNG Custody Power Station located near Engro Polymer and KE Bin Qasim Power Complex.

2. **Fundamental Principles.**

- a. KE understands and commits itself as a responsible member of corporate family to the safety of its employees, workers, contractors, sub-contractors, neighbors, stake holders and community at large.
- b. All efforts and drives shall be initiated while laying the line to inform all stake holders and neighbors in the vicinity about risks and hazards associated with the RLNG Transportation.
- c. Periodic and preventive condition monitoring and maintenance of the line as mentioned in para 3c shall be done as established in due consultation with OEMs, suppliers, designers and contractors during construction phase.
- d. All Local, national, and International laws related to HSE and technical compliances for pipelines of such nature shall be complied with at all stages from conception to erection, pitching, commissioning and then operations as well.
- e. RLNG supply pipeline shall be the integral part of Bin Qasim Power Complex, therefore, HSE plan for the Complex shall also be applicable to the pipeline to the relevant extent.
- f. Compliance of DGRA's Standard SRO No. 675(I)/2004 shall be ensured for RLNG Spur Pipeline.

3. **Procedural Considerations**

- a. **Understanding RLNG.** The first and foremost responsibility of all stake holders involved in planning, designing, pitching, commissioning, operations, and safety of RLNG Pipeline demands an understanding of RLNG which shall include but not limited to following guidelines:-
 - (1) LNG Stands for Liquefied Natural Gas whose MSDS No is 2015001 and is also sometime interpreted as LNG, RLNG, Liquid Methane, Natural Gas Refrigerated Liquid. It is produced in number of countries where natural gas is in abundance for further transportation through shipping vessels and where possible through intra continental pipelines as well.
 - (2) **Hazard Identification/Classification**
 RLNG is categorized as among flammable gases category one and gases at high pressure (Under the United nations Globally harmonized system of classification and labeling of chemicals GHS, the lower the hazard category number, the greater the hazard and the higher the hazard category number, the less severe the hazard). Signal Word for RLNG shall be DANGER and in hazard statements the term extremely flammable gas H220 shall be used as it contains refrigerated gas which may cause cryogenic burns or injury H281.

Pictograms



National Fire Protection Association (NFPA)* 704 Hazard Rating

Health: 3 Flammability: 4 Instability: 0
(0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)



Hazardous Material Identification System (HMIS)* Hazard Rating

Health: 3 Flammability: 4 Physical Hazard: 3
(0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Liquefied Natural Gas

HEALTH	3
FLAMMABILITY	4
PHYSICAL HAZARD	3
PERSONAL PROTECTION	


(3) Precautions

- Do not use or handle unless all safety precautions have been read and understood.
- Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources, including internal combustion engines. No smoking.
- Take action to prevent static discharge, including static discharge from cell phones and other electronic devices.
- Wear cold insulating gloves, a cold insulating apron, eye protection, and face shield.
- If exposed to liquid, seek immediate medical attention.
- Eliminate all ignition sources if safe to do so.
- Limbs affected by frostbite may be thawed with lukewarm water. Do not rub affected area. See immediate medical attention.
- Do not extinguish fires from leaking gas unless leak can be stopped safely. (P377) * Store in a well-ventilated space. (P403) **
- Use only non-sparking tools. (P242) **
- Applicable GHS Hazard Code.
- ** Applicable GHS Precautionary Statement Code.

(4) Supplementary Hazard Information.

- High concentrations of RLNG vapors may displace oxygen, especially in a confined space.
- RLNG and its vapors do not exhibit the characteristic odor of natural gas.
- Containers of RLNG are typically under pressure and temperature-controlled conditions.
- These containers may explode if heated or if temperature control is not maintained.

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(5) Composition and ingredients of LNG.

RLNG is gasified form of Liquefied natural gas (LNG) which is a cryogenic liquid derived from natural gas by processing. LNG consists primarily of methane and ethane; the table below identifies the components in LNG that may be present in concentrations of 1 percent or more by volume. For health and safety determination purposes, the LNG composition listed in the table below represents the widest range of components observed in the LNG produced and stored by PGW based upon the results of sample analysis. The following constituents may also be present in LNG at concentrations less than 1 percent by volume: iso-Butane, normal butane, pentanes, hexanes, heavier hydrocarbons (C6+), and nitrogen.

Component Name	Synonyms	Chemical Formula	CAS Number	Concentration (% Volume)
Methane	Methyl hydride, marsh gas, carbane	CH ₄	74-82-8	67-97
Ethane	N/A	C ₂ H ₆	74-84-0	3-29
Propane	N/A	C ₃ H ₈	74-98-6	0-4

(6) First Aid Measures. Keeping in view likely impacts and effect of LNG in case of release to humans following First Aid Measures shall be taken

- **Eye Contact:** Contact with product may cause frostbite. In case of frostbite or freeze burns, gently soak the eyes with cool to lukewarm water. **DO NOT WASH THE EYES WITH HOT WATER** (i.e. over 105F). Open eyelids wide to allow liquid to evaporate. If the person cannot tolerate light, protect the eyes with a bandage or handkerchief. Do not introduce ointment into the eyes without medical advice. Seek immediate medical attention.
- **Skin Contact:** Contact with product may cause frostbite. In case of frostbite or freeze burns, remove contaminated clothing, and flush the affected area with cool to lukewarm water. Immediately place frozen area in a circulating warm water bath or in flowing warm water (100 to 105F). **DO NOT USE HOT WATER** (i.e. over 105F) OR DRY HEAT. Seek immediate medical attention if blistering, tissue freezing, or frostbite has occurred. Under no circumstances should the frozen part be rubbed, either before or after warming.
- **Inhalation (Breathing):** Inhalation of large quantities of LNG vapors may cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. LNG and associated vapor are a simple asphyxiant and may cause loss of consciousness, serious injury, or death by displacing air, thereby resulting in insufficient oxygen to support life. Prompt medical attention is strongly recommended in all cases of inhalation overexposure. Rescue personnel should be equipped with a self-contained breathing apparatus. Remove inhalation victims to fresh air quickly. If inhalation victim is not breathing, ensure that their airways are open and administer cardiopulmonary resuscitation

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(CPR). If necessary, have a trained person administer air or oxygen once breathing is restored. Seek immediate medical treatment.

- **WARNING: The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause loss of consciousness, serious injury, or death.**
- **Ingestion (Swallowing):** This material is a gas under atmospheric temperature and pressure conditions and ingestion is unlikely. Seek immediate medical attention if material is ingested.

(7) Fire Fighting Procedure

- LNG vapors are extremely flammable and can be ignited by heat, sparks, flames, static electricity, and other sources of ignition, such as pilot lights, mechanical/electrical equipment, and electronic devices that are not intrinsically safe. Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. Vapors may accumulate in confined spaces.
- LNG fires should not be extinguished unless the source of the leak can be stopped safely.
- In most cases, it is best to eliminate the source of the leak and allow the liquid to burn off.
- Isolate the leak area, particularly around the ends of storage vessels, and maintain a safe distance upwind and uphill of the leak area.
- Let the vessel, tank, or container burn unless the leak can be stopped.
- LNG is stored under pressure and temperature-controlled conditions; containers of LNG exposed to excessive heat or flame may rupture violently and suddenly without warning due to vessel over pressurization.
- Fragmentation of the container should be anticipated.
- Withdraw immediately in the event of a rising sound from a venting safety device.
- Use water fog and/or deluge to cool equipment, surfaces, and containers exposed to fire and excessive heat.
- Do not direct water at the source of the leak, pooled LNG, or safety devices; the indiscriminate use of water on surfaces of cryogenic containers and piping can lead to heavy icing, causing excessive loads on structures and the failure of valves, instrumentation, and other control devices.
- Application of water to pools of LNG will cause the LNG to vaporize more rapidly, generating more gas to feed a fire or create a larger vapor cloud.

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- For large fires, use unmanned hose holders or monitor nozzles to minimize personnel exposure. Appropriate fire extinguishing media include dry chemical, carbon dioxide, halon, and high expansion foam.
- While water may be used to cool equipment and structures adjacent to an LNG fire, water is not an appropriate extinguishing media when responding to LNG fires as water can increase the volatilization of the LNG or cause ice formation as described above.
- Refer to Section 8 for Exposure Controls/Personal Protection and refer to Section 9 for flash point and flammability limits (explosive range). Refer to Section 16 for the National Fire Protection Association® 704 Hazard Rating.

(8) Accidental Release Management

- In case of an accidental release, KE shall activate the facility's contingency plan which may include following measures.
- Evacuate non-essential personnel and secure all ignition sources. Do not allow road flares, smoking, cell phones, or other sources of ignition in the hazardous area. Internal combustion engines generate sparks that would serve to ignite LNG vapors, so do not drive vehicles through the vapor dispersion area, and do not attempt to start vehicles that are within the vapor dispersion area.
- Evaluate wind direction and speed to determine the direction of product travel. The vapor cloud may be white, but the color will dissipate as the cloud disperses; however, the fire hazard is still present! Stay upwind and uphill, if possible, and avoid low lying areas.
- Test the area for hazardous atmospheres before re-entering. Stop the source of the release, if safe to do so.
- Ventilate confined areas and check for hazardous atmospheres before entering.
- Notify relevant authorities in accordance with all applicable requirements.
- Refer to Section for Exposure Controls/Personal Protection.

(9) Handling during Storage at various intermittent storage points

- When handling LNG, wear all appropriate personal protective equipment as described in Section 8 to avoid contact of material with eyes, skin, or clothing.
- Handle only with adequate ventilation, and do not breathe LNG vapors. Eliminate all sources of ignition, such as flames, sparks (including from internal combustion engines), or high temperatures when working in areas where vapors may be present.
- Ground and bond all lines to avoid static discharge buildup when transferring product (i.e. truck loading/unloading).



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- Use non-sparking tools when working around LNG transfer lines and equipment. Be sure that all electrical equipment used in the area is UL listed Class I, Division 1, Group D hazardous locations. Do not use cell phones in an area where LNG is stored or transferred.
- Polyester clothing may cause static discharge and must not be worn at LNG locations. Avoid cold burns from transfer lines or process equipment.
- Store LNG only in specifically designed, cryogenic containers in a cool, dry, isolated, well ventilated area away from heat and sources of ignition.
- Do not store LNG adjacent to oxidizers or other incompatible materials as listed in relevant Section.


{10} Exposure Control Parameters for Personal Protection

- As far as LNG release or leakage is concerned following parameters shall be referred to while dealing with exposure control issues and personal protection of the personal

Component Name and CAS Number	ACGIH TLV	OSHA PEL	NIOSH IDLH	Notes
Methane 74-82-8	TWA: 1,000 ppm	N/A	N/A	Simple Asphyxiant
Ethane 74-84-0	TWA: 1,000 ppm	N/A	N/A	Simple Asphyxiant
Propane 74-99-6	TWA: 1,000 ppm	TWA: 1,000 ppm	N/A	Simple Asphyxiant

- ACGIH: American Conference of Industrial Hygienists
- OSHA: Occupational Safety and Health Administration
- NIOSH: National Institute for Occupational Safety and Health
- TLV: Threshold Limit Value - PEL: Permissible Exposure Level
- TWA: Time Weighted Average
- IDLH: Immediately Dangerous to Life and Health - ppm: Parts per million
- Engineering Controls: Provide adequate ventilation to keep gas and vapor concentrations below occupational exposure and flammability limits (less than 20% of the lower explosive level) and maintain sufficient oxygen levels. In confined spaces, local and general ventilation should be provided. Follow appropriate confined space entry procedures. Use explosion proof general ventilation and lighting in classified/controlled areas. Be sure explosion proof flashlights and equipment are used.
- Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is a potential for liquid to contact the eye. Depending upon the conditions of use, a face shield may also be necessary.
- Skin/Hand Protection: Wear thermal insulating gloves and a face shield when working with materials that present thermal hazards (hot or cold). Ensure that the protective

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equipment is rated for the temperature of the material to be handled. Flame retardant clothing is recommended in any situation where LNG vapors may ignite accidentally.

- **Respiratory Protection:** A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH). A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant the use of a respirator.

(11) Physical & Chemical Properties as are required to be referred while planning handling and management of LNG

- Appearance of LNG is a colorless liquid. Cold gas may freeze water vapor in the air, creating a visible white cloud. The visible cloud is useful for determining wind direction & product dispersion, but it does not define the boundary of the combustible gas. Combustible vapors may exist outside of the visible cloud. -
- State: liquid (refrigerated gas) -
- Odor: LNG is odorless; it does not exhibit the characteristic odor of natural gas.
- Odor Threshold: N/A*; LNG is odorless. - pH: N/A
- Melting Point/Freezing Point: No data available
- Boiling Point: -259F (-162C)
- Flash Point: < -306F (< -188C)
- Evaporation Rate (n-butyl acetate = 1): >1
- Flammability: Liquid LNG is not flammable, but its vapors are flammable.
- Lower Explosive Limit (vol % in air): As low as 4.0% depending upon LNG composition; the higher the ethane content, the lower the lower explosive limit.
- Upper Explosive Limit (vol % in air): As high as 15.0% depending upon LNG composition; the higher the methane content, the higher the upper explosive limit. -
- Vapor Pressure: Approximately 700 psia at -110F -
- Vapor Density: 0.0435 – 0.0481 lb/ft3 at 14.7 psia and 60F -
- Relative Vapor Density: 0.57-0.60 at 14.7 psia and 60F; 1.5 at 14.7 psia and <-160 oF (Air = 1.0); NOTE: The vapor density is heavier than air when the vapor temperature is less than 160F; this phenomenon will occur when the LNG vapors are initially released from the LNG liquid).
- Liquid Density: 3.5-4.0 lbs/gallon at -260F (H2O = 8.33 lbs/gallon at 60F) -
- Relative Density/Specific Gravity: 0.43 at -260F (H2O = 1) -

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- Solubility in Water: Negligible, below 0.1%
- Partition Coefficient (n-octanol/water): No data available
- Auto-Ignition Temperature: 999F (537C) -
- Decomposition Temperature: Not applicable
- Viscosity: No data available
- Heat of Vaporization: 220 BTU/lb
- Percent Volatile: 100
- Expansion Volume: Approximately 625 to 1
- *N/A indicates Not Applicable.

(12) Stability, reactivity, and Compatibility of LNG

- **Reactivity:** When LNG vapors mix with appropriate amounts of oxidizing agents, including air and oxygen, in the presence of an ignition source, an uncontrolled explosive reaction can occur.
- **Chemical Stability:** LNG is stable under controlled conditions of use.
- **Possibility of Hazardous Reactions:** Not applicable.
- **Conditions to Avoid:** LNG vapors are extremely flammable and explosive; avoid heat, sparks, open flames, and all possible sources of ignition. Heat will increase pressure in the storage tank.
- **Materials to Avoid (Incompatible Materials):** LNG vapors will form explosive mixtures with air or oxygen and will also burn or explode in the presence of strong oxidizing agents such as chlorine, chlorine dioxide, bromine pentafluoride, oxygen difluoride, liquid oxygen, and nitrogen trifluoride.
- LNG will spontaneously ignite when mixed with chlorine dioxide.
- Also avoid contact with acids, aluminum chloride, and halogens. **Hazardous Decomposition Products:** Thermal decomposition products may include carbon monoxide, carbon dioxide, smoke, and other toxic combustion products.
- **Hazardous Polymerization:** Not known to occur

(13) Toxicity & its Management

- **Inhalation:** LNG vapors are not toxic; however, if LNG vapors escape and accumulate in a confined area or if large amounts of LNG vapor are released as a result of a leak, the LNG vapors may displace air from the area and cause loss of consciousness, serious injury, or death.
- **Skin Absorption:** Contact with liquefied or pressurized gas will cause severe frostbite, but otherwise, this product is not expected to cause skin irritation.

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- **Serious Eye Damage/Irritation:** Contact with the liquefied or pressurized gas may cause eye damage and swelling. Otherwise, this product is not expected to cause eye irritation.
- **Skin Corrosion/Irritation:** Contact with liquefied or pressurized gas will cause severe frostbite, but otherwise, this product is not expected to cause skin irritation.
- **Skin Sensitization:** Skin contact should be avoided, and sensitization as a result of skin contact is not expected.
- **Signs and Symptoms:** Light hydrocarbon gases are simple asphyxiants and can cause anesthetic effects at high concentrations. Symptoms of overexposure, which are reversible if exposure is stopped, include shortness of breath, drowsiness, headaches, confusion, decreased coordination, visual disturbances, and vomiting.
- **Continued exposure can lead to hypoxia** (inadequate oxygen), rapid breathing, cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness, and death.
- **Carcinogenicity:** LNG is not expected to cause cancer. This substance is not listed as a carcinogen by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP), or OSHA.

(14) Ecological Impacts and their management

- **Ecotoxicity:** Petroleum gases are volatile & rapid evaporable both land & water.
- **Persistence and Degradability:** Not expected to remain on land surface or water for any period. **Bio accumulative Potential:** No data available.
- **Mobility in Soil:** No data available.
- **Other Adverse Effects:** No data available.

b. Compliance of World Bank & IFC Guidelines with regards to RLNG Pipeline Project.

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice. When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS Guidelines are designed to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry sector guidelines may be necessary. A complete list of industry sector guidelines can be found at www.ifc.org/ehsguidelines.

c. Bin Qasim LNG Pipeline Project Specific HSE Plan & Arrangements.

The line to be laid between the terminal station till BQPS Power Complex shall be approximately 2 KM as shown in the plan




(1) Scope of HSEQ Plan

- This Plan covers the Health, Safety, Environment & Quality (HSEQ) System of LNG Pipeline Project for Bin Qasim Power Complex located at PQA, Karachi. The HSE system has been developed to keep ourselves as close as practically feasible to the ISO-14001-2015 Standard on Environment Management System, OHS 45001-2018 Occupational Health & Safety Management System Furthermore ISO-9001-2015, and Quality Management System.
- This Plan shall apply to all the employees, workers, staff, contractual employees or contractors and their sub-contractors who deem to work with in the areas control of BQPS Management.
- This Plan serve as a basic guideline for overall HSEQ Management System, however for job specific or function specific more elaborate Standard Operating HSEQ Procedures shall be developed and continuously improved upon for good ground controls.

(2) Context of the Project Team.

As per BQPS Power Complex Quality Management System It is imperative to determine internal and external issues and concerns related to BQPS power complex and also assess the expectations of the interested Parties for which a Sub-QMR committee was promulgated which included rep from HSEQ, Operations, Maintenance & Admin departments who conducted multiple cross functional discussions and evaluations and ultimately prepared this document as referral during various business/operational activities of the Plant. As a matter of principle teams and employees need to understand that the ultimate objective of successful construction, operations and business continuity

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cannot be achieved without good quality & safety management system. It is furthermore important that all those factors that can influence or effect our operations and/or business activities shall be identified and established. While establishing issues and concerns that may affect the plant operations or business activities it is also important that the expectations of the contractors, vendors, stake holders and/or interested parties are also known.

(3) External Issues & Concerns.

Following External Issues are hereby declared as pivotal to our business continuity/Plant Operations.

- **Security.**

BQPS Power Complex sharing more than 70% need of electricity of Karachi which makes it vulnerable to anti state elements. It makes the plant as national asset. Resultantly we expect to have high level of security of the plant for which KE as Mother Organization has delegated a Full Fledge and well-equipped security team headed by retired military officer of 80 plus grade. Furthermore, security commitment and coordination has been established with local police, rangers, intelligence agencies and PQA Authority for unforeseen or unexpected needs related to security. More than 200 CCTV Cameras have further been incorporated to augment security needs. A Security and safety access system is in place at the gate. Security Clearance Management system is introduced for new hires and even contractors.


- **Availability of Critical Equipment's, Parts & Resources.**

Where Plant Operations & Business Continuity is largely dependent on supply of basic raw material, it also depends upon good and timely maintenance plans. These Maintenance plans and regimes depend upon supply chain of many critical equipment's and parts which may not be necessarily available in local or immediate market. Thereafter it was mandated that all such critical equipment's/supplies must be proactively procured with Minimum/Maximum level storage parameters defined or established. This is being done at BQPS Complex and Min Max levels have been declared by the Complex.

- **3rd Party Contractors & Vendors.**

As BQPS Power Complex Team shall continue to understand that where regular employees would continue to play most significant part in its operations and business continuity the contractors and vendors would remain involved. The bigger challenge would remain the diversity and alignment of contractors with our work environment and conditions. To address the same a special contractor management system is introduced at the Plant. Vendors and contractors are managed through a declared KE Liaison Officer. Furthermore, each contractor must pass through safety induction system, and they must further depute or delegate their own monitoring system.

- **Attendance & Availability of Requisite Staff.**

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Due to road and traffic situation there may be an occasion where some or complete of the Plant Teams may not be able to reach the plant. In that case the preceding shift shall continue to operate, and all efforts shall be made to facilitate necessary and accessible employees to reach the Plant. Furthermore, to address the problem rest rooms have been incorporated closed to admin block.

- **Environmental Issues.**

The location of BQPS Power Complex in the proximity of the Arabian Sea makes it vulnerable to environmental concerns like humidity and corrosion. In this regard maximum efforts shall be made to use anti corrosive paints, equipment's, enhanced frequency of PM Plans.

- **Statuary & Legal issues.**

BQPS Power Complex wherein, operates under the management and control of KE Head Office It considers itself responsible to national and international laws and the statuary /legal bodies ensuring the implementation of those laws and enactments. They surely serve as influencers for our operations and control. Resultantly we shall maintain a Legal Register (A document that contains and carries extracts if relevant laws and/or rules.


(4) Internal Issues & Concerns.

Following internal Issues and Concerns are hereby identified and pronounced for clarity of all Team Members BQPS Power Complex:

- **Business Continuity Needs & On Job Trainings.** The fact that the plant must remain in continued operation makes it difficult for operations team to be available for trainings away from BQPS Power Complex, so they must be given on job trainings covering RLNG pipeline as well.
- **Hazardous Areas.** Hazardous Gases, Hot surfaces, chemical hazards, and process related risks have been taken care of in basic design engineering. However due to process disruptions, workmanship issues etcetera there exist an inherent risk in the operations and business continuity to employees, contractors, and workers. Various steps have been taken by the management of the plant to mitigate all such risks from engineering controls to administrative controls. Safety Induction Management System, Safety Access Management System and the Work Permit System are few of the mechanisms that help to generate requisite safety discipline.

(5) Interested Parties. BQPS Power Complex as Business Unit of K-Electric clearly understands that there may forge number of interested parties having multi-dimensional interests in our plants. The expectations of these interested parties are well known to Plant Team and management so that we can conduct and interact accordingly. It helps us in ensuring good quality management system. These parties may include but shall not be limited to the following:

- **General Public,** that serves as the consumer of our product that is electricity. As consumers every consumer expects continuous supply of electricity. Though this expectation is directly managed by

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LDC however in case the plant becomes unreliable or unavailable due to internal failures the plant may become responsible for such err. With this expectation in mind our complete quality management system aims at facilitating the good performance.


- **Contractors & Vendors.** During operations large number of vendors and contractors may also be interested in limited or long-term maintenance/supply contracts. It entails proactive scrutiny of the right contractors and well processed contracts.
- **PQA.** Plant is in PQA geographical and administrative ambits. As plant team we fully acknowledge that PQA rules and regulations are equally applicable on us. Close coordination with PQA Fire & Security teams shall be continuous affair. BQATF is a forum created by PQA and we remain active member of this forum.
- **Neighboring Industries.** Due to Environmental Issues, safety, security and support functions the nearby industries are also one of the interested parties i.e. Tuwairqi Steel Mills Limited in the North, Coal Jetty, DP world, PSO Terminals in the West and 1320 MW Coal Power Plant, BQPS-I & Engrs in the East. Having established these industrial neighbors as interested parties a special coordination and cooperation efforts shall continue to be in place with these organizations.
- **Statutory Bodies & 3rd Party Certification Groups.** They would also expect us to follow local and international laws, standards related to our Plant and having established this BQPS Power Complex Team continuously shall thrive to achieve and meet up to the required expectations of these bodies and regulators.

(6) Specific Scope of QMS.

- BQPS Power Complex Quality Management System shall be applicable to all KE employees working at Plant and/or the contract workers engaged through manpower or 3rd Party Job contracts.
- It would include operational as well as nonoperational area working.
- It is imperative for each employee to understand that though we have only electricity as an end product which is supplied to LDC for further dispatch to end consumers through distribution but the uninterrupted generation and supply of electricity serves as the end result of our good work practices and QMS.

(7) Continual Improvements. To ensure that all teams are engaged in improving the work conditions, processes, plant operation and administration of the Plant management expects following sub systems be implemented in different cadres

- Operational Risk Assessment be a continuous process and before every work permit risk assessment in writing be carried out and record shall be available with permits.
- Equipment Failures shall be dealt with Equipment Incident Report briefly expressed as EIR, which shall include Root Cause Analysis through team for each failure and shall be managed by the Performance Department.

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- Process Related Failure and plant tripping shall be separate reported, recorded and investigated by the Performance Department.
- Safety & Environmental incident shall be reported through an incident/accident reporting management system under the umbrella of HSEQ.
- After Audits or incidents as the modifications are advised they shall be incorporated through a set quality management system with written traceable record of all modifications taking course at plants.
- For dealing with Mess & Hygiene related issues a separate complaint register shall be in place to ensure that improvements can be suggested, and each employee has access to contribute to Plant Quality Management system.
- Performance Review meetings and reports shall serve as indicators of overall improvement or plant performance.
- EOP – emergency operating procedures shall be prepared and maintained by the operations team.
- Maintenance standard operating procedures shall be prepared and maintained by Maintenance team.
- Admin department shall organize all its functions through set of written standard operating procedures related to Food Facility, Induction a gate, transport management, rest house management and head Imprest management.
- Stores shall identify and establish procedures for material inward / outward gate passes, Store Issuances and store management
- HSEQ department shall also document its safety and environmental standards operating procedures in documented form and shall continue to keep all employees aware of these procedures. These procedures shall be periodically reviewed for continual improvement and process improvement.

(8) BQPS Power Complex HSEQ Policy Guideline

- **Principle Statement.** BQPS Power Complex Management in align with KE Management is committed to the provision and maintenance of safe and healthy work conditions, equipment and procedures for its employees, contractual staff and contracted companies and/or visitors visiting the Plant Site. It is the policy to ensure as far as is reasonably practicable,
 - A safe BQPS Power Complex and safe systems of work.
 - Health, safety, and welfare of all employees while at work.
 - Safe use, handling, storage and transport of articles and substances.
 - Adequate welfare facilities as are mandated for safe workplace.
 - Availability of necessary information, instructions, training, and supervision to the employees.

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- **How would it be achieved?** This will be achieved using comprehensive safety rules, procedures and codes of safe practice relating to activities. BQPS Power Complex Management will:
 - Provide the necessary standard operating procedures and resources for establishing and ensuring safe working environment at Plant. (This will include hazard identification, the use of written risk assessments, planning & implementing necessary actions and reviewing the adequacy of these measures).
 - Development and availability of Plant Emergency/evacuation Procedure/Plans.
 - Remain in conformity with local, provincial, national, or international regulations on safety as far as practically practicable.
 - Provide, maintain, and ensure the use of necessary safety equipment including Personal Protective equipment, tools, or other items necessary for the safe execution of work.
 - Provide continuous health and safety surveillance where appropriate. Furthermore, recognize representatives of employee safety.
 - Record & investigate accidents and dangerous occurrences & implement changes where required.
 - Monitor safety performance using self-audits independent audits external audits.
 - Review the policy, organization, and arrangements annually, or when changes in legislation, plant, personnel, or procedures require it.

(9) Employee Responsibility. At BQPS Power Complex we truly believe that "Safety is Everyone's Individual Responsibility" and in order to endorse this statement we expect all employees to remain aware of their Safety Responsibility i.e. they shall work in accordance with the laid down Plant Procedures and will try to remain updated with any changes thereof. Furthermore, BQPS Power Complex Management obligates its employees/personal to comply with any statutory Health and Safety obligations (or arrangements specified in this safety policy) for themselves or others who may be affected by their acts or omissions.

(10) Contractors & Their Employees. All contractors who are engaged to work for KE BQPS Power Complex shall be expected to adhere to BQPS Power Complex Safety Policy and Procedures. However, they shall be directly responsible for the safety and conduct of their sub-contractors, employees, and workers. To ensure this BQPS Complex Management expects that all Process Owners from KE shall ensure this compliance through safe and proactive contracts/execution supervision.

(11) BQPS Power Complex – HSEQ Responsibility

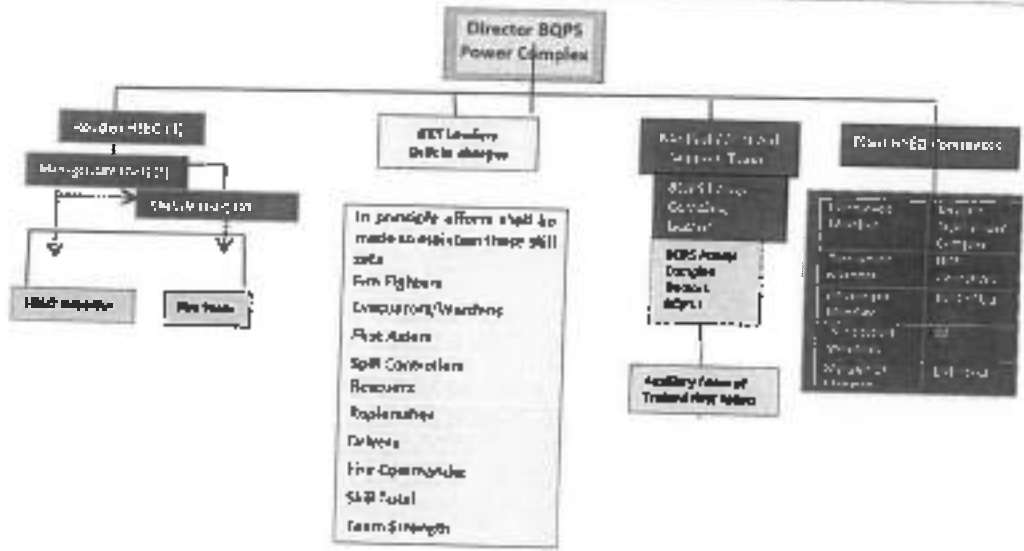
- **Basic Understanding.** BQPS Power Complex Operates under the Management of KE Head Office within the Umbrella of Generation Management however our HSEQ Depart also remains align with KE Corporate HSEQ Directives.

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- **HSEQ Structure at the Plants.** At BQPS Power Complex HSEQ Management will be organized through following
 - (1) Principle Responsibility : Safety Is Everyone's Individual Responsibility
 - (2) Functional Responsibility : All Functional Heads are responsible to ensure that their departments, teams, units & sub-units perform in accord with basic & standard HSEQ Parameters and they remain in concurrence with applicable company policies, procedures & also those required by the state
 - (3) Advisors & Monitors : HSEQ Departments and teams would serve as anchors and managers of all safety drives apart from providing necessary advisory as well as monitoring support to their management on all HSEQ Issues and Concerns
 - (4) Plant Management : Plant Management would provide an environment facilitating growth of HSEQ Culture at Plant apart from exhibiting highest standard of HSEQ Commitment
 - (5) Special Committees : Plant HSEQ Structure would be further strengthened through various Committees i.e. Plant HSEQ Committee, Mess Management Committee, Special Incident Investigation Committee as when deemed necessary
 - (6) G&T HSE : Being Part of G&T HSE Group the Plant HSEQ Responsibility is also shared by Safety Team who would continue to provide necessary Guidance and Supervision to Plant HSEQ Team

(12) BQPS Power Complex HSEQ Structure.

Apart from this Fundamental Structure of HSEQ Function, Following Structure will be used to coordinate various HSEQ Management Activities and drives.



(13) HSEQ System Implementation (Resources, Roles, Responsibility, Accountability & Authority)

- **Basic Philosophy.** For an effective HSEQ system provision of necessary resources (which include financial, equipment and trained human resource), clear and documented roles & responsibilities of personnel and delegation of authority with necessary checks and balances is necessary.
- **Essential Features.** Management is fully committed to establish, document, implement and continually improve the HSEQ Management System based on the Health, Safety & Environment (OHS 45001:2018) and EMS (14001:2015)
- The management shall provide evidence of this commitment through:
 - Showing visible commitment to HSE effort
 - Ensuring the availability of resources essential to establish, implement, maintain, and improve the HSEQ Management System.
 - Defining roles, allocating responsibilities and accountabilities, and delegating authorities to facilitate effective HSEQ.
- **Management shall nominate a Management Representative to ensure that requirements established in accordance with relevant HSEQ standards are implemented and maintained.**
 - Management Representative shall ensure that the HSEQ management system is established, implemented, and maintained in accordance with this Standard.
 - Management Representative shall ensure that reports on the performance of the HSEQ management system are presented to top management for review and used as a basis for improvement of the HSE management system.

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(14) HSEQ Objectives & Targets

- **Basic Philosophy** Objectives and targets are activities or projects which the company wishes to carry out to make improvements to working practices and maintain a safe working environment. The Management shall develop a system enabling:
 - Setting of HSE goals and objectives.
 - Communication of these objectives to the organization and to and to all stakeholders.
 - Review of performance on achieving these objectives.
- **Essential Features**
 - **Goals and Objective setting:** The objectives shall be in line with HSEQ Policy and KE's corporate safety objectives. The objectives shall be specific, measureable, attainable, and realistic and time bound (SMART).
 - Every department shall also develop its own goals. Ultimately, these shall cascade down as specific objectives for everyone whereby everyone contributes towards achieving corporate objectives.
 - **Communication of goals and objectives:** The goals and objectives shall be clearly communicated to management and other stakeholders.
- **Review of Performance.** The performance on the set goals shall be reviewed periodically through various mechanisms like,
 - Stewardship at HSEQ forums (Corporate Safety Committee meeting, HSE Committee meeting etcetera)
 - Annual Personnel Appraisal system
 - Maintain Safety KPI's such as Days since Lost Time Injury, Total Recordable Injury Rate etc.

(15) HSEQ Legal & Statutory Requirements

- **Basic Philosophy.** The Management shall shape the processes and operations to achieve HSEQ objectives without compromising legal requirements. The Management shall identify, plan, and abide by all legal requirements set forth by Government of Pakistan and other HSEQ codes which are applicable to business. The Management shall continually review performance on compliance of the legal requirements and update ourselves on any new developments or legislation governing our operations.
- **Essential Features.** A procedure shall be in place to ensure the following:
 - Identify & maintain all prevailing legal & other HSE requirement concerning our operations.
 - Assign clear responsibility of ensuring compliance & meeting all requirements of such laws.
 - Identify documentation and records that must be maintained.
 - Periodically review any changes in prevailing laws or development of new laws governing the operation.

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- o Periodically audit the compliance to the requirement using spot and documentary audits.

Foot Note: A Register of applicable legal requirements shall be developed.

(16) Hazard Identification, Risk Assessment and Determining Controls

- **Basic Philosophy.** The first step towards implementing an HSE system is to identify the existing hazards. Once these hazards have been identified the next logical step is to evaluate the associated risk in a systematic and methodical way and implement controls to mitigate risks. However, sometimes a modification or a condition may change the risk assessment previously carried out. In situations like these, there is a need to properly manage the change. Therefore, Management shall provide procedures for:
 - o Hazard Identification & Risk Assessment
 - o Management of Technology Change
- **Procedure of Hazard Identification and Risk Assessment.** Risk Assessments use an organized, methodical study approach to achieve a multi-disciplined consensus on Hazard control of identified Risks. There is no one method for hazard identification and risk analysis. As a rule, the type and rigor of the risk assessment process adopted shall depend on the potential severity of the harm that could occur and the likelihood of occurrence. For the greatest severity consequences or where there are high levels of risk, very rigorous risk analysis (Quantitative) is required. On the other hand, where the consequences are less serious and/or the level of risk is low, simpler techniques (Qualitative) can be used.
- **The Risk Assessment shall consider:**
 - o Routine and non-routine processes.
 - o Activities of all persons having access to workplace.
 - o Human behavior, capabilities, and other human factors.
 - o Any identified external hazards
 - o Infrastructure, equipment, and materials at workplace.
 - o Changes in organizational structure.
 - o Legal requirement relating to risk assessment.
 - o Design of work areas, processes, installations, machinery / equipment, operating procedures, and work organization.
 - o Risk Assessment activity shall be periodic and systematic.
 - o Risk Assessment can also be used to evaluate an infrequent or one-time activity.
 - o Scope, timeline, and responsibility of conducting a Risk Assessment shall be defined.

(17) Procedure for Management of Change

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- A change in approved philosophy of operation, operating conditions, control systems, equipment, parameters, or limits of safe operation can introduce new hazards to the existing system. The change must be assessed for any hazards out of such modifications.
- A change or a modification may be classified according to nature, scope, and time for which the change is valid. The Change shall be classified as.
 - Permanent Change
 - Temporary Change
- Management shall develop, maintain, and implement a procedure to ensure that:
 - Every modification is evaluated with respect to legal requirements, prudent engineering and industry practices and available standards before approval.
 - A documented approval is available authorizing the modification.
 - All controls identified in the assessment have been implemented and are continuously in place.
 - All temporary changes are reverted or rolled back when the need is over, and system is restored to original condition.
 - Pre-startup checks after the modification have been carried out and information of modifications, changes, and temporary arrangements is disseminated to all concerned.
 - Foot Note: A separate documented procedure shall be developed that details the procedure for identification of safety Hazards and their further evaluation for Risk Assessment.

18. HSEQ Training, Awareness & Orientations

- **Basic Philosophy.** Training, improvement in awareness and development in competence of human resource is recognized as being a vitally important function for implementing an effective HSE system. All employees must have the necessary understanding of their functions, responsibilities, and activities within the HSE.
- **Essential Features.** The Management shall ensure that personnel under its control involved in Plant operation & maintenance are competent in the basis of appropriate education, training or experience and shall maintain associated records.
- The Management shall provide a system for assessing the needs for HSE related training.
- The Management shall develop, implement, and maintain a procedure to make person working under its control aware of.
 - The OH&S consequences, actual or potential of their work activities, their behavior, and the OH&S benefits of improved personal performance.
 - Understanding the role and responsibility in achieving conformity to the OH&S policy and procedures and to the requirements of the OH&S management system.



- Knowledge of roles and responsibilities in emergency planning and for dealing with emergency situations (fuel spills, fire, chemical leaks etc.).
- Knowledge of potential consequences of departures from specific operating procedures.
- HSE department shall maintain the training record.

Foot Note: Separate HSEQ Training Plan and Training SOP shall be developed

19. HSEQ Communication, Consultation & Participation

- **Basic Philosophy.** Communications cover an extremely wide range of activities, from informal discussions through to board level meetings. It is therefore necessary to specify the key safety communication requirements of the company and to ensure that all these requirements are always followed. Management believes that success of the HSEQ system depends on the participation and internal motivation of the employees. Therefore, we need to provide initiatives and programs which should engage the employees and motivate to them to raise the level of HSE performance on continual basis.
- **Essential Features**
- **Communication.** The safety communications procedure provides a listing of the key channels for internal and external transfer of information. This may be required by employees, regulators and other interested parties on a regular basis or other communications which may be tailored to specific requests as and when required. Various forms of communication shall include:
 - **Safety Meetings:** Safety Meetings like HSEQ Committee meeting, Safety Talks and toolbox talks shall provide opportunity for communication between management and employees.
 - **Special Safety meetings** can be called by the management as and when required.
 - **Notice boards:** Controlled use of notice board shall serve as opportunity for communicating new policies, notices, and information from management.
 - **Safety Suggestion Boxes:** Safety suggestion boxes shall be provided at various locations within the plant. This will enable employees to provide valuable feedback and suggestions to the management. These Suggestion Boxes will be managed by HSE Department.
 - **Newsletters:** Project team shall contribute regularly in Company's newsletter with articles narrating efforts on HSEQ. This will serve as a motivation for employees and show visible commitment of management towards HSE.
 - **Reports:** Periodic reports to management such as Audit Reports, non-conformance notes, minutes from review meetings and similar flows of information.



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- **Employee Participation & Motivation.** Management believes that success of the HSE system depends on the participation and internal motivation of the employees. Therefore, we need to provide initiatives and programs which should engage the employees and motivate them to raise the level of HSE performance on continual basis. Some initiatives may be:
 - **Safety Star of the Month:** An employee will be declared Employee of the Month. The criteria for nomination and procedure for selection shall be clearly communicated to all. The criteria may be reviewed from time to time based on changing KPI and areas of focus.
 - **Safety Walks:** This shall be a periodic event where a group of employees will observe a section of plant, highlight and address safety concerns. A record of such safety walks shall be maintained.
 - **Housekeeping Day:** A day shall be designated as Housekeeping Day, when employees shall attend to weak areas of the plant with respect to housekeeping. This shall be a routine program.

(20) Documentation


- Following documentation management mechanism shall be established at KE- Generation – BQPS Power Complex LNG Pipeline Project, Level One: Safety Policy & HSEQ manual, System Management Notifications/ Approvals, Level Two: System Operating Procedures, Level Three: Safety Monitoring, Audits Records, Training Records, Legal requirements such as permits, authorizations and related documents which specify legal requirements, Equipment testing & Maintenance record (e.g. fire extinguisher inspection report). Documents including records required by the Organization for planning and operation controls. The Documentation is needed to ensure planning, operation and control of processes that relate to the management of its HSE risks and maintained through by both Hard and Soft media.
- **Control of Documents**
 - **Basic Philosophy.** The mandatory HSEQ documents required by the standards shall be controlled. HSEQ department has the responsibility to control all Occupational health & safety related documents.
 - **Essential Features.** To meet the requirements with respect to Control of Documents, the Management shall develop, implement, and maintain a procedure to.
 - ❖ Approve and ensure adequacy of information before issue of document.
 - ❖ Continual review, revision, and re-issuance of documents.
 - ❖ Ensure that changes and current revision are identified and available at point of use.
 - ❖ Ensure the documents remain legible, in good condition, and readily identifiable.
 - ❖ Prevent the unintended use of obsolete documents by removal from point of use or through suitable identification.

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❖ If required, obsolete documents are retained for special purposes like legal and for knowledge preservation and they are positively identified.

(21) Operational Control

- **Basic Philosophy.** Clear, accurate and detailed operations and maintenance procedures are required for operating the plant within the safe operating limits and maintaining it during its useful life. Management shall provide the necessary resources and training to staff for maintaining and adhering to these procedures.
- **Essential Features.** Following shall be the general requirements for the procedures:
 - The procedures shall be consistent with OEM supplied procedures, recommendation, routine updates & notifications as well risk assessments carried out by site personnel.
 - Procedures shall be updated and approved prior to implementing any change to chemicals, technology, or facilities.
 - Approving authorities for procedures of each section shall also be defined. The procedures must be reviewed and updated as needed or at a regular frequency.
 - Usually 1-year review cycle or as per requirement. In case of urgency an addendum shall be circulated to all stake holders. The management shall ensure at the time of release of documents that current revision is available with the department.
 - Previous and old version shall be lifted at the time when new procedure handed over to department.
 - In case any need of old document at workplace is required for any reference it shall be documented.
 - The format and contents of these procedures shall be oriented towards accurate and relevant information for the employees associated with the work to be done. Procedures must be easily understood by the users, i.e. process operators. Written procedures should follow human factor principles to reduce the potential for error. Some examples of these principles are:
 - ❖ Use of a columnar format instead of a narrative one.
 - ❖ Use of a simple numbering system.
 - ❖ Each step should "stand by itself".
 - ❖ Piping and equipment sketches
 - ❖ Test it for "how easy it is to be followed?"
 - ❖ Include precautions and notes
 - ❖ Checklists
 - ❖ Log-sheets

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❖ Provision for ample pictures, sketches, and diagrams. The management shall ensure that operating procedures are current and accurate.

(22) HSEQ Procedures

- A Work Authorizing Procedure describing authorization for working at plant, process for safe handing over of equipment and isolation from sources of energy when maintenance is required, training and evaluation needs for personnel.
- Procedures for special activities like working at heights, in confined spaces or with radioactive sources (during NDT when required).
- Procedures for Hazardous chemical handling, loss of containment (major leaks) and response in case personnel are exposed.
- Procedures for any unique and one-time activity.
- Any other documents which are mandatory for HSEQ Implementation.


(23) Maintenance Procedures

- Maintenance Procedures shall be primarily driven by OEM and Vendor supplied procedures and routine updates. Improvements can be made based on site experience and periodic risk assessments. However, any deviation from OEM recommended shall be allowed only after thorough review and approval.
- The procedures shall be maintained in form of bound manuals as supplied by the Vendor. Job plans and procedures attached in SAP PM Module shall form part of these procedures.
- Preventive Maintenance records shall be maintained (preferably in SAP otherwise in print) by the Maintenance Department.
- The adherence to Preventive Maintenance plans shall be semiannually audited by the Management.


(24) Contractor HSEQ Management. At KE BQPS Power Complex LNG Pipeline Project we strongly feel that contractors and their workers working for us are part of us especially when they are working on our premises and for our benefit. It shall be our moral responsibility to keep them aligned and updated with our HSEQ requirement right from the Initiations of contracts and till their completion. To comply with these requirements, we shall issue a detailed and separated procedure.

(26) Emergency Preparedness & Response. Management shall conduct our business with professionalism and deluge, once so that the facility is operated within design and safe considerations. However, the risk of an untoward incident remains. A system shall be in place to:

- Provide a prompt and coordinated response during an unexpected event that will ensure the protection of the staff, the plant, the public and the environment.

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- List the foreseeable hazards and emergencies that could arise and provide procedures to be adhered to and outline the responsibilities and actions to be taken by designated company staff.
- Ensure an effective mode of communications between company staff on and off site, and the relevant authorities for the co-ordination and management of the response to an emergency.
- Maintain a level of preparedness in the form of emergency response drill, inspections and testing of emergency handling equipment.
- A written emergency plan shall be developed taking in to account the outcome of consequence and Hazard Analysis.
- The written procedure shall provide clear responsibilities and role statements of responsible personnel. The plan shall encompass elements like
 - Information of incident
 - announcement of emergency
 - Responsibilities and role statements of all individuals, especially those with emergency response duties
 - evacuation of personnel and safe shutdown of plant,
 - communication to all concerned agencies,
 - personnel accounting and
 - rescue operation including medical emergencies
- A written emergency action plan shall be created to terminate any (small or large) release of hazardous material and to bring under control any resulting fires. Such a plan shall address the following subject area:
 - Emergency shutdown procedures, including isolation, venting, or purging as appropriate.
 - Activation of emergency systems such as water sprays or deluge systems.
 - Acceptable emergency repair procedures and/or service.
 - Activation of site emergency squad or notification of local / surrounding emergency response organizations.
 - Shutdown of adjacent facilities as appropriate.
 - Barricading of affected facilities.
 -
- Site personnel shall be trained in the prompt and efficient implementation of the above emergency plans, to include the following:
 - Conducting emergency drills at appropriate frequencies.
 - Involvement and participation of local emergency response organizations in site drills at appropriate frequencies.

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- o These should involve all aspects of the emergency management organization, with designated observers and key role players, including a formal documented critique identifying areas for improvements and follow-up responsibility.
- o Minimum training requirements should be defined and training programs commensurate with the duties and functions that these groups perform should be provided including the contractor employees.
- o Facilities should be designed and properly equipped to facilitate the effective management of any emergency.
- o A system should be in place for documenting and tracking recommendations and for effectively communicating them to the appropriate level within the organization.
- o There should be periodic stewardship of the emergency preparedness programs to responsible management, in which performance and concerns can be objectively reviewed and evaluated.

(27) Plant HSEQ Performance Measurement


- **Basic Philosophy.** Management shall establish, implement & maintain a procedure to monitor and measure the HSEQ performance and ensure compliance of the legal requirements on regular intervals.
- **Essential Features.** Plant Management will employ various means for recording of quantitative measures and indicators to monitor performance of HSEQ system.
 - o Days since Last Time Injury,
 - o Total Recordable Incident Rate,
 - o Statistics of Injuries (first aid cases, medical treatment case, lost Time Injuries and Fatalities)
 - o Near miss and unsafe acts
- **Recording of qualitative measurements like:**
 - o Quality & Safety Audits identifying Non-Conformances to Procedures, unsafe conditions, and unsafe acts (use of PPE etc., attitude, position of people while working etc.)
 - o housekeeping audits (with pictorial reports),
 - o work permit audits
 - o Data is analyzed and used for taking proactive measures for improving performance.
 - o If equipment is used to monitor or measure performance, the procedure shall ensure calibration.
 - o Periodic evaluation of compliance to legal requirements. The records of such evaluation shall be maintained.

(28) HSEQ Incident Investigation & Management System

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- **Basic Philosophy.** Management believes that reporting and analysis of incidents provides valuable opportunity to learn about the break downs or deficiencies in our safety management system. Serious incidents and near misses recur unless key factors are identified and corrected. Thorough and persistent investigation of all such incidents, coupled with actions directed at prevention of recurrence, continually improve safety. We shall ensure that all safety, health & environment incidents and untoward events taking place during operation are investigated and reported irrespective of their severity, in compliance with relevant HSEQ standards, so that corrective and remedial measures can be taken to prevent recurrence of such incidents in future.
- **Essential Features.** A Procedure shall be in place to encourage employees to report all incidents openly, having actual or potential safety / environmental consequences. Essential feature of the procedure shall be:
 - Incident investigations shall be initiated as promptly as possible as but no later than 48 hours following the incident.
 - Responsibility for filing of incident reports within the organization and communication with governmental agencies should be clearly assigned.
 - Investigations should seek to determine the root cause as well as the immediate cause for the failure of management system. Corrective action must address both areas. Attention should be paid to identify relevant risk assessment procedures or elements that were not correctly followed, and action taken to eliminate similar incidents in future.
 - A detailed incident investigation report shall be prepared for the all the incidents/incident selected for comprehensive investigations.
 - A follow-up system shall be established to ensure prompt follow-up and resolution of all incident investigation report recommendations.
 - Resolution and corrective actions shall be documented and maintained along with the incident report files.
 - The incident reporting system should provide for closure and stewardship of follow-up actions.
 - Incident reports shall be retained for five years.
- **Incident reports shall be shared with appropriate personnel.** Incident performance shall be analyzed for trends on an ongoing basis. The focus shall be on:
 - Prompt detection of significant changes and
 - Prevention of recurring incidents.

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- Personnel who will conduct Incident Investigations and analyses must be given training in techniques of investigation with emphasis on determining root causes in relation to safety management systems.
- The detailed procedure shall be developed for record, investigate, and analyze incidents and identify opportunities for preventive action and their continual improvement.

(29) Non-Conformity, Corrective Action & Preventive Action

- **Basic Philosophy.** Management is committed to continual improvement of our HSE System. In this regard, we will continuously monitor our performance and the system for any weaknesses. The detection and communication of an obvious non-conformance will provide us the opportunity to make necessary and timely corrections to achieve the company's safety objectives.
- **Essential Features** The essential features of the procedure shall be.
 - Identifying and correcting nonconformity and taking actions to mitigate their OH&S consequences.
 - Investigating Nonconformity, determining their causes and taking actions to avoid their reoccurrence.
 - Preventive and corrective actions are undertaken where it has been found that safety procedures and controls are not adequate to maintain the required level of safety performance as defined in safety policy.
 - Controls are applied and implemented by all the departmental heads to ensure that Corrective Actions are taken and that they are effective and prevent recurrence.
 - Corrective and Preventive Action is constantly followed by concerned in charge Plant or Departmental Head and monitored by HSE department.
 - HSE Department shall be responsible for maintaining a record of all Corrective Action Request forms and reports and communicate to concerns.
 - The status of all open and pending Corrective Actions Forms shall be reviewed in HSE Committee meetings and status will be reported to Corporate HSE Department.

(31) Internal Audits – HSEQ

- **Basic Philosophy.** Audits provide a structured, documented, and acceptable approach for review of performance. Internal Audits shall be used:
 - To encourage continual improvement.
 - To give management feedback on the effectiveness of their system.
 - To help employees understand the company's goal and procedures.
 - To monitor progress against objectives and targets.

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- o To ensure compliance against company's policies and procedures related to EMS, QMS & ISO
- **Essential Features.** Management shall establish and maintain documented procedures for conducting internal audits. The Procedure shall address:
 - o The responsibilities, competencies, and requirements for planning and conducting audits, reporting results, and retaining associated records; and
 - o The determination of audit criteria, scope, frequency, and methods
- The HSEQ department shall be responsible for planning and implementing Internal Audits to establish:
 - o Compliance with the requirements of this HSEQ System
 - o Effective implementation of requirements set by HSEQ System
 - o Effectiveness in compliance to Safety Policy and Objectives
- Selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process.
- Results of Internal Audits shall be discussed in management review meeting and submitted to Top Management.
- The detail of audit procedure shall also be established

(32) Management Review


- **Basic Philosophy.** Top Management shall review the OHS Management System at planned intervals to ensure its continuing suitability, adequacy, and effectiveness.
- **Essential Features.** Inputs to management review shall include:
 - o Results of Internal audits
 - o Results of Participation & consultation
 - o Relevant communications
 - o HSE performance
 - o Objective achievement status
 - o Status of incident investigations
 - o Follow up of previous review actions
 - o Review of changes
 - o Recommendation for improvement
- The Top Management shall provide timely and necessary decisions and actions for required changes to:
 - o HSE performance
 - o HSE policy & Objectives
 - o Resources



- Output from management review shall be communicated to all stakeholders.

(33) Environmental Compliance Requirement.

- Environmental compliance requirements are identified in Legal Compliance Register (KESC-SP-07) for reviewing the applicability of provincial and federal laws and regulations affecting KESC business operations and facilities.
- As regulations are subject to change over time, and as new regulations are promulgated by regulatory agencies, periodic review of regulations to stay current on compliance requirements are conducted as necessary through (KESC-SP-07) procedure.
- At the conception of all new projects, preliminary environmental impact assessment studies form the priority of the company. Based on this policy of giving due regard to environmental conservation in all areas of its operations, Environmental Management/Monitoring Procedure is (KESC-SP-015) followed to minimize environmental consequences of construction activities of new projects.
- Environmental emissions pertaining to our Generation operations are monitored as per Environmental Emission Procedure (KESC-SP-016) and regular compliance reports generated for onward submission to the regulatory bodies, lender institutions and other external stakeholders.
- A comprehensive Waste Management procedure is in place at KE that provides guidelines for the storage, tagging and generation of waste (KE-SP-12). This procedure is designed to minimize the possibility of a threat to human health or the environment caused by fire, or any unplanned release of hazardous waste materials into the air, soil, or surface water.
- BU / Divisions generating waste shall cooperate with Corporate Health Safety & Environment Department to ensure the safe and proper identification, collection, accumulation, packaging, and disposal of wastes.
- BU / Divisions who generate waste are encouraged to participate in Waste Management training program offered by Corporate Health Safety & Environment department.
- Spill Prevention Procedure (KESC-SP-017) has also been prepared for those facilities that require spill control management. These control techniques assist KESC personnel in responding to hazardous material spills at facilities. Personnel having responsibilities under this procedure are provided with the necessary training to ensure they are competent to fulfill the roles established in this procedure (KESC-SP-017).
- Facilities have been supplied with emergency spill equipment for use in emergency response. The Safety officer / Coordinators regularly inspect KESC facilities to ensure that adequate spill supplies are available, and information contained in the procedure is

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current. Inspections generally confirm the following for those facilities that maintain hazardous waste/material storage areas:

- o Accessible wireless/telephone/Cellular or two-way communication.
- o Telephone number of the emergency coordinator or response plan head.
- o Telephone number of local fire and police stations.
- o Easily accessible and portable fire extinguisher.
- o Easily and accessible spill clean-up equipment.
- o Readily available water supply.
- o Documentation that employees have been instructed in emergency response procedures.

[34] HSEQ Preventive Maintenance on SAP. HSEQ Team at BQPS Power Complex RLNG Pipeline Project will also carry out routine preventive Maintenance checks to ensure that HSEQ Accident Prevention Plan through various engineering provisions remains healthy and intact during all the time. For this reason alone, various HSEQ Activities shall be incorporated in SAP to keep good management of these activities. These Activities or Preventive Maintenance Checks include,

S/N	Title
1	Fire Tender Arrangements
2	Windsock inspection
3	Line Markers Integrity and availability
4	Fire alarm Panels inspection at RLNG Inlet area
5	Fire Drill Mock Drills
6	Inspection of Safety Signs
7	Noise Survey
8	PPE's Inspection
9	Line Condition Monitoring
10	Anti-Corrosion and environmental audit
11	Inspection of Valves and Couplers
12	Inspection from the point of view of security

35. Conclusion. This Plan will serve as umbrella and preliminary document for BQPS Power Complex RLNG Pipeline Project HSEQ Concerns and shall be augmented with Activity specific safety instructions, System based SOPs, OEM prescribed guidelines and management orders to ensure overall good compliance and management of HSEQ Management before design while drafting various plans and contracts, during execution phase of the project and after the commissioning of the line at the time of operations and then as and when maintenance is done.

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 <p>Zishan Engineers (Pvt.) Ltd. An ISO 9001-2015 certified company. 47/B, Block 6, PECHS, Karachi-Pakistan Tel: (92-21) 34393043-48 & 34310151-54 Fax: (92-21) 34353430 & 34310950 E-mail: info@zishanengineers.com Web: www.zishanengineers.com</p>	Document No.	255-S-DER-001
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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

DESIGN BASIS REPORT

ISSUED FOR TENDER

01	08-04-2020	Issued for Tender	MW	AH	MM
Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 INTRODUCTION

K-Electric Limited intends to construct a Spur Pipeline for supply of RLNG to 900 MW CCPP and also to fulfill the requirements of the KE Bin Qasim Power Complex. The Spur Pipeline will be laid for supply of 250 MMSCFD RLNG at 85bar from a suitable point at the RLNG Supplier's main pipeline which is connecting the existing Gasport RLNG terminal with the SSGC's Custody Transfer Station situated at approximately 2 km from BQPS. This spur pipeline shall connect the delivery point situated at KE's Bin Qasim Power Complex with the main pipeline through a T-off connection immediately prior to the main pipeline entering into CTS.

2.0 BASIC DESIGN PARAMETERS

2.1 Site and Environment Data

The system shall be designed taking into account the following extreme climate conditions.

Table 1: Site and Environment Data

Description	Minimum	Maximum
Relative humidity	30	95
Temperature (°C)	3	50
Wind velocity (Km/hr)	180	
Elevation (m.a.s.l)	5.5	

2.2 Noise

The unit will target a maximum specified noise limit of 85 dB(A) at 1 meter from radiating surfaces in locations accessible to personnel, measured at 1.5M above ground in a free field environment.

2.3 Wind Load

Wind load shall be designed in accordance with UBC-1997 and ASCE-7. Design wind speed to be used shall be 100 mile/hr.

2.4 RLNG Composition and Properties

Components		RLNG Composition (Mole%)	
		Reference # 2	Reference # 1
Methane	CH ₄	99.700	81.60
Ethane	C ₂ H ₆	0.100	13.40
Propane	C ₃ H ₈	0.000	3.700
Iso-Butane	i-C ₄ H ₁₀	0.000	0.700
N-Butane	n-C ₄ H ₁₀	0.000	0.000
Iso-Pentane	i-C ₅ H ₁₂	0.000	0.000
N-Pentane	n-C ₅ H ₁₂	0.000	0.000
N-Hexane	n-C ₆ H ₁₄	0.000	0.000
Heptane	C ₇ +	0.000	0.000
Octane	C ₈ +	0.000	0.000
Nonane	C ₉ +	0.000	0.000
Decane	C ₁₀ +	0.000	0.000
Undecane	C ₁₁ +	0.000	0.000
Nitrogen	N ₂	0.200	0.700
Oxygen	O ₂	0.000	0.000
Carbon Dioxide	CO ₂	0.000	0.000
Total		100	100
Estimated Specifications			
Higher Heating Value (Btu-SCF)		1001	1168
Lower Heating Value (Btu-SCF)		908	1065
Wobbe Index (Btu/SCF)		1358	1444
Modified Wobbe Index @ Temp 5 °C		54.597	58.387
Modified Wobbe Index @ Temp 5 °C		53.007	56.705
Modified Wobbe Index @ Temp 5 °C		52.031	55.662
Specific Gravity		0.555	0.667
Methane Number		99.7	66.6

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2.5 Pipeline Operating Conditions

Flow Rate	:	250 MMSCFD
Inlet Pressure	:	85 Barg
Inlet Temperature	:	5 - 32 °C

3.0 HYDRAULIC ANALYSIS

Hydraulic analysis of the pipeline has been performed on computer software ASPEN HYSYS. Details of basis of hydraulic analysis and results are as follows:

3.1 Basis of Analysis

Following are the basis of hydraulic analysis:

- RLNG Flow Rate : 250 MMSCFD
- RLNG Composition & Properties : Refer section 2.4 above
- Equivalent Length : 2,400 m

3.2 Analysis Result

Hydraulic Analysis has been conducted and the result is tabulated below:

HYDRAULIC ANALYSIS				
Line Size (Inch)	Inlet Pressure (Barg)	Pressure at KE battery limit (Barg)	Velocity (m/s)	Pressure Drop (Bar)
12	85	77.90	12.80	7.1
14	85	81.95	8.88	3.05
16	85	83.51	6.63	1.49

Above table indicate that RLNG velocities in 12", 14" & 16" are in within the acceptable range. The pressure drop in 12" pipeline is much higher, however, Pressure drop in 14" and 16" line is within the limits. Therefore, 14" line has been selected.

4.0 LINE PIPE

The line pipe grade proposed for the 14" pipeline system is API 5L Gr. X-65. The pipe wall thicknesses have been calculated accordingly. The thicknesses for the pipeline have been evaluated for the following design conditions:

- Design pressure as defined in ASME B 31.8
- Location classes as per ASME B 31.8
- Traffic loads at road crossings as per API 1102

Considering the building population of the areas forming the pipeline route, Location Class 3 has been selected for pipeline design. A Design Factor of 0.5 has, therefore, been used for the computation of allowable stresses, as per Location Class 3 of ASME B31.8.

The pipe thickness has been calculated as per the Steel Pipe Design Formula of ASME B 31.8, Para 841.11, based on design pressure.

Sample calculation for 14" pipe is given below:

Using the formula
$$P = \frac{2St}{D} \text{ FET}$$

Where,	D	=	Pipe outside diameter	=	14 in.
	S	=	Specified min. yield strength	=	65,000 psi
	E	=	Longitudinal Joint Factor	=	1.0
	T	=	Temperature Derating Factor	=	1.0
	F	=	Design Factor	=	0.5
	P	=	Design Pressure	=	1450 psig
			Calculated line pipe thickness, t	=	7.933 mm

With the addition of corrosion allowance of 1.6 mm, the required wall thickness becomes 9.533 mm. The selected wall thickness based on available API thicknesses for 14" line pipe size is 10.312 mm.

Road/ Highway crossing design calculations shall be undertaken according to API 1102. The minimum depth of cover at crossings is 1200 mm as recommended by API 1102. Use of Set-On Saddle Bags (Echo Bags or equivalent) is being proposed for water locked area, to provide protection against buoyancy.

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4.1 Conclusion and Recommendation

Following is being proposed for the pipeline system:

- The line pipe recommended is 14" NPS, Wall Thickness - 10.312 mm, API 5L Grade X-65, SAWL for main line and crossings.
- Flange rating is ANSI/ASME 600 #.

5.0 COATING SYSTEM

A 3-Layer Polyethylene (3 LPE) corrosion protection coating is proposed for the steel pipeline system.

The minimum coating thickness shall not be less than 3200 microns (3.2 mm) consisting of:

- 300 microns Fusion Bonded Epoxy (FBE)
- 300 microns Copolymer Adhesive
- 2600 microns High Density Polyethylene (HDPE)

6.0 CATHODIC PROTECTION SYSTEM

Sacrificial galvanic anode based CP system is proposed for K-Electrics 2 KM, 14" dia RLNG spur pipeline.

6.1 Design Parameters

Design Life:	30 years
Coating:	3 Layer Polyethylene (3LPE) – Pipeline 3-layer tape of polyethylene material – Terminal piping
Soil resistivity:	As per actual measurements, to be conducted by Contractor
Isolation:	All buried pipes/pipelines to be isolated from the above ground portions using Insulation flanges
Plant Grounding:	To be isolated from the buried portions of the pipes

The evaluation of the current demand necessary for the CP shall be carried out from the design input data.

The current CP requirement shall be estimated by Contractor as per the coating status and applicable coating breakdown factors specified in the relevant codes. Following is only a preliminary baseline minimum requirement

Current Density: 20mA/m² (Bare Steel)
 1mA/m² (Coated buried piping)

7.0 CIVIL/STRUCTURAL DESIGN BASIS

STEEL STRUCTURES DESIGN SPECIFICATION

7.1 Applicable Codes and Regulations, Project Specifications and Standards

The following code and standards shall be applied wholly or in part thereof in combination with this document, to the detailed design of all steel structures:

- ASTM: American Society for Testing and Materials
- ASCE-7: American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- AISC – ASD 89 – American Institute of Steel Construction
- AWS D1.1 American Welding Society Structural Welding Codes-Steel
- UBC -97: Uniform Building Code
- IBC 09: International Building Code

7.2 Design Tools and Softwares

- Staad Pro V8i (Select 3 Series or latest version)
- Ram Connection
- AutoCAD

7.3 Material Strength

7.3.1 Steel Structure

All structure steel shall be as per ASTM A36 or equivalent, with minimum yield strength of 36000 psi.

7.3.2 Connections Bolts

All bolts used for structure steel connections shall be high strength bolts as per ASTM A325 ($f_y = 558 \text{ Mpa}$, $F_t = 724 \text{ Mpa}$) or equivalent. All bolts shall be hot dip galvanized as per BS729 or equivalent Standard.

7.4 Design Loading

The Structure shall be designed for following Loadings:

7.4.1 Self Weight

Self Weight is the dead load of structure members and shall be calculated as per the material densities.

▪ P.C.C	:	22 KN/m ³
▪ R.C.C	:	24.5 KN/ m ³
▪ Brick Masonry	:	18 KN/ m ³
▪ Steel	:	76.98 KN/ m ³

7.4.2 Dead Load

Dead loads are the weight of equipment and all materials permanently fastened thereto or supported thereby, including piping attached to equipment, fire proofing, electrical conduit and insulation.

7.4.3 Live Load

Live loads shall be defined as the weight of all movable loads such as personnel, tools, miscellaneous equipment, and stored material.

Live loads shall be uniformly distributed over the areas. Live Load recommended for different areas shall be as follows:

▪ Access Walkways	:	5.00 kN/m ²
▪ Operating Platforms	:	5.00 kN/m ²
▪ Stairways & Landings	:	4.00 kN/m ²

7.4.4 Wind Load

Wind load on structure and equipment shall be determined in accordance with ASCE 07/UBC-97. Basic parameters for calculating wind load shall be as follows:

- Basic wind Speed : 45 m/s.
- Importance factor : 1.15
- Exposure : Category C

7.4.5 Seismic Load

Seismic forces due to self weight of structure and on equipments shall be determined in accordance with the Uniform Building Code 1997/IBC 09. Basic parameters for calculating seismic load shall be as follows:

- Zone category : Zone 2B. ($z = 0.2$)
- Importance factor : $I = 1.25$
- Soil Profile Type : As per Geotechnical investigation report

7.4.6 Empty Load

Dead load of equipment, without any product.

7.4.7 Operating Load

Operating loads are the dead load of equipment plus the weight of any liquid or solids present within the vessels, pits, sumps, equipment or piping during normal operation.

7.4.8 Test Load

Vessels or tanks, for which the hydrostatic tests shall be carried out, shall be identified in the loading data.

Piping load on sleepers or on pipe supports, subject to the hydrostatic tests shall be considered in the design.

Equipment mounted structures or Pipe rack that hold more than one vessel or more than one piping shall be assumed to take a hydrostatic test for one vessel or one piping if hydrostatic test is required.

7.4.9 Piping Load

The effects of loads due to piping including insulations/covering/fireproofing etc. gases/liquids flowing through pipes shall be taken into account. Actual loads to be taken directly from piping plan and details.

Piping loads (including self weight of piping) shall be considered as live loads, unless specifically approved otherwise.

Maximum piping load shall include the weight of all pipes, valves, fittings, insulation, etc., and the weight of contents.

7.4.10 Piping Anchor Load

For pipe racks, sleepers and pipe supports, the pipe anchor force shall be calculated on the basis of the thermal stress analysis of the piping system.

7.5 Load Combinations

Load Combinations shall be as per applicable codes

7.6 Design Method

The design and details of steel structures shall be in accordance with AISC "Manual of Steel Construction, Allowable Stress Design, Ninth Edition", 1989. Allowable stress can be increased 33 % for load combinations of short-term.

7.6.1 Allowable Deflection Limit

Vertical deflection and Horizontal displacement shall not exceed the following:

Vertical Deflection:

▪ Beam Supporting floor/Pipe	:	L/240
▪ Beams Supporting Pipe	:	L/240
▪ All Other beams	:	L/200
▪ Beam Supporting Equipment	:	L/500
▪ Cantilever Beam	:	L/180

Horizontal Displacement:

- Frames : H/300
- Cantilever Column : H/200

7.6.2 **Slenderness ratio**

The slenderness ratio of compression/tension members shall not exceed the following values:

- Primary members in compression : 180
- Secondary members in compression : 250
- For tension bracing with L/r shall be less than 300.

7.6.3 **Clearances****Overhead Clearances:**

- Platforms, Walkways and Work Areas : 2,140 mm
If personnel require access beneath
- Pipe Racks : 2,750 mm
- Over Pumps, Turbines etc : Manufacturer's requirements
- Over primary roads : 6,000 mm
- Over Maintenance roads : 4,800 mm

8.0 CONCRETE DESIGN SPECIFICATION**8.1 Applicable Codes and Regulations, Project Specifications and Standards**

The following documents shall be applied wholly or in part thereof in combination with this document, to the detailed design of foundations and structures:

- ASTM: American Society for Testing and Materials
- ASCE-7: American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
- ACI 318/318R/318M-08: Building Code for Requirements for Reinforced Concrete
- UBC -97: Uniform Building Code
- IBC 09: International Building Code

8.2 **Material Strength**

8.2.1 **Concrete**

All concrete shall be as per ASTM and shall have 28 days cylinder strength not less than the follows:

- Substructure/ Superstructure $f_c' = 4000 \text{ psi (28 Mpa)}$
- Lean $f_c' = 1500 \text{ psi (10 Mpa)}$

8.2.2 **Steel Reinforcement**

All Steel reinforcement shall be hot rolled deform bars conforming to ASTM A-615, with minimum yield strength of 60000 psi (416 Mpa).

8.2.3 **Anchor Bolts**

All anchor bolts shall be as per ASTM A307 ($f_y = 248\text{Mpa}$, $F_t = 400 \text{ Mpa}$) or A325 ($f_y = 558 \text{ Mpa}$, $F_t = 724 \text{ Mpa}$) or equivalent and shall be hot dip galvanized as per BS729 or equivalent Standard.

8.3 **Load Combinations**

Load Combinations shall be as per applicable codes

8.4 **Foundation Design**

8.4.1 **Serviceability Factors**

a) **Bearing Capacity:**

Allowable soil bearing capacity shall be taken as per the recommendation of Geotechnical Investigation report.

b) **Safety Factor for Stability of Foundations:**

Minimum factor of safety against sliding & overturning shall be as listed below:

Factor of Safety Against Overturning		Factor of Safety Against Sliding	
Erection	Operating case	Erection	Operating case
1.5	2.0	1.5	1.75

9.0 INSTRUMENTATION & CONTROL DESIGN BASIS

ESDV-001 and ESDV-003 shall be provided at downstream of RLNG supplier's tie in point. These ESDVs shall be closed on activation of high and low pressure switches. PSHH-001, PSHH-003, PSLL-001 and PSLL-002 shall be used for activation of these ESDVs.

ESDV-001 and ESDV-003 shall be located inside RLNG supplier's premises. Instrument air for these valves will be made available from existing IA system available at the facility. Tie-in from existing IA header up to these instruments will be included in Contractor's scope. In case of unavailability of IA from RLNG supplier's facility, EPC Contractor shall consider Slam Shut Valve in place of ESDV-001 and ESDV-003.

ESDV-002 shall be provided at the inlet of KE facility. This ESDV will be closed on activation of PSHH-002.

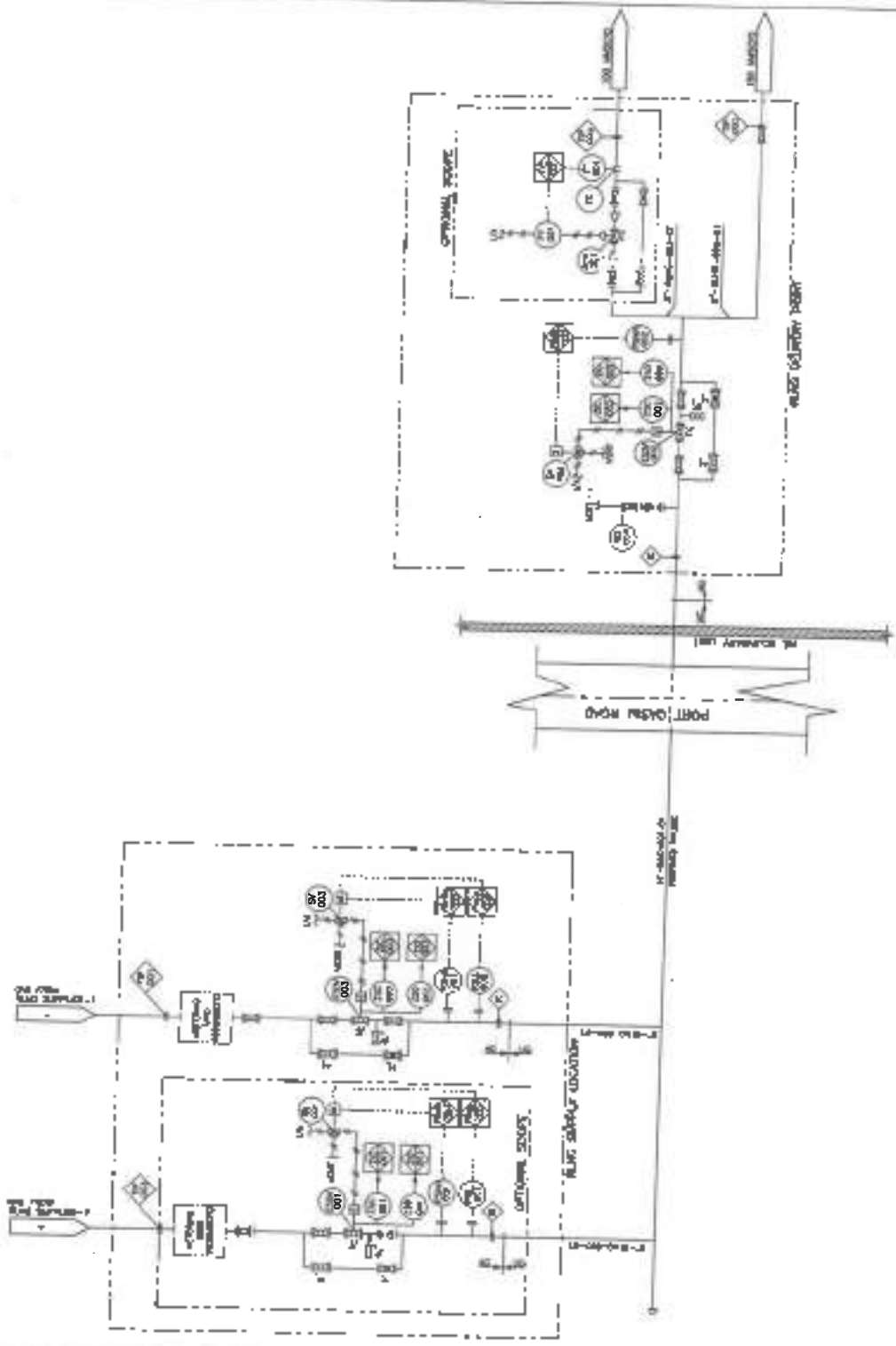
Instrument Air (IA) for ESDV-002 shall be supplied from existing IA System. Tie-in from existing air header up to these instruments will be included in Contractor's scope.

Shutdown valve ESDV-002 and its respective pressure switch will be connected to KE's existing control system, whereas, ESDV-001 and ESDV-003 with its respective pressure switches shall be connected to RLNG supplier's control system.

NOTES:

1. Review the relevant specifications to be observed and ensure that work is done in accordance with the requirements of the relevant specifications and standards.
2. Installation shall be in accordance with the relevant specifications and standards.
3. The manufacturer's instructions shall be followed.
4. The manufacturer's instructions shall be followed.
5. The manufacturer's instructions shall be followed.
6. The manufacturer's instructions shall be followed.
7. The manufacturer's instructions shall be followed.
8. The manufacturer's instructions shall be followed.
9. The manufacturer's instructions shall be followed.
10. The manufacturer's instructions shall be followed.

RESTRICTED AREA



LEGEND/SYMBOLS

- 1000 BALL VALVE
- 1000 GLOBE VALVE
- 1000 GLOBE VALVE KIT (K)
- AC ABOVE GROUND
- UC UNDER GROUND
- TIP TIP IN POINT
- RB RESTRICTED ORIFICE

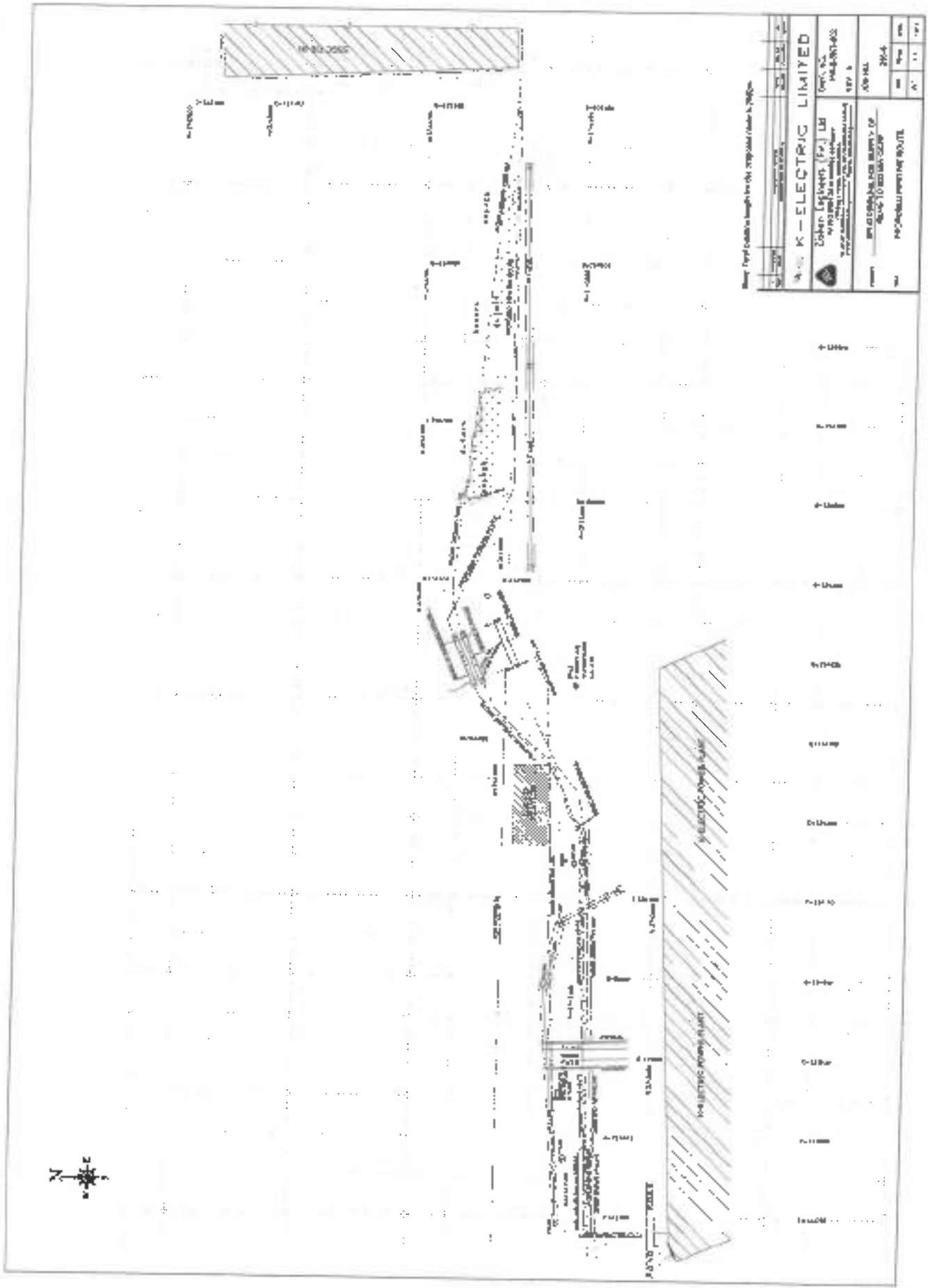
PIPING CLASS

- D1 GARDEN STEELWELD 40MP

LINE NUMBER IDENTIFICATION

- LINE SIZE 14" - SWG - 001 - 01
- SERVICE
- LINE NO
- PIPING SPEC

NO.	REV.	DATE	BY	CHKD.	APP.
1	1				
<p>Zetech Engineers (Pvt.) Ltd. No. 10, Main Road, Colombo 10, Sri Lanka. Tel: 011-26111111, 26111112, 26111113, 26111114, 26111115, 26111116, 26111117, 26111118, 26111119, 26111120, 26111121, 26111122, 26111123, 26111124, 26111125, 26111126, 26111127, 26111128, 26111129, 26111130, 26111131, 26111132, 26111133, 26111134, 26111135, 26111136, 26111137, 26111138, 26111139, 26111140, 26111141, 26111142, 26111143, 26111144, 26111145, 26111146, 26111147, 26111148, 26111149, 26111150, 26111151, 26111152, 26111153, 26111154, 26111155, 26111156, 26111157, 26111158, 26111159, 26111160, 26111161, 26111162, 26111163, 26111164, 26111165, 26111166, 26111167, 26111168, 26111169, 26111170, 26111171, 26111172, 26111173, 26111174, 26111175, 26111176, 26111177, 26111178, 26111179, 26111180, 26111181, 26111182, 26111183, 26111184, 26111185, 26111186, 26111187, 26111188, 26111189, 26111190, 26111191, 26111192, 26111193, 26111194, 26111195, 26111196, 26111197, 26111198, 26111199, 26111200.</p>					
<p>M. ELECTROTECH LIMITED 100, Main Road, Colombo 10, Sri Lanka. Tel: 011-26111111, 26111112, 26111113, 26111114, 26111115, 26111116, 26111117, 26111118, 26111119, 26111120, 26111121, 26111122, 26111123, 26111124, 26111125, 26111126, 26111127, 26111128, 26111129, 26111130, 26111131, 26111132, 26111133, 26111134, 26111135, 26111136, 26111137, 26111138, 26111139, 26111140, 26111141, 26111142, 26111143, 26111144, 26111145, 26111146, 26111147, 26111148, 26111149, 26111150, 26111151, 26111152, 26111153, 26111154, 26111155, 26111156, 26111157, 26111158, 26111159, 26111160, 26111161, 26111162, 26111163, 26111164, 26111165, 26111166, 26111167, 26111168, 26111169, 26111170, 26111171, 26111172, 26111173, 26111174, 26111175, 26111176, 26111177, 26111178, 26111179, 26111180, 26111181, 26111182, 26111183, 26111184, 26111185, 26111186, 26111187, 26111188, 26111189, 26111190, 26111191, 26111192, 26111193, 26111194, 26111195, 26111196, 26111197, 26111198, 26111199, 26111200.</p>					




Scale: 1:500

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Date: 10/10/2008	
Scale: 1:500	
Project No: K-ELECTRIC LIMITED	

1	OFFICE
2	WORKSHOP
3	STORE
4	ROAD
5	UTILITY LINE
6	FENCE
7	DRAINAGE
8	DRAINAGE
9	DRAINAGE
10	DRAINAGE
11	DRAINAGE

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 Zishan Engineers (Pvt.) Ltd. An ISO 9001:2015 certified company. 47F, Block 6, PECES, Karachi-Pakistan Tel: (92-21) 34393045-48 & 34310151-54 Fax: (92-21) 34333130 & 34310156 E-mail: contact@zishanengineers.com, Web: www.zishanengineers.com	Document No.	255-B-SPM-001
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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
SAW LINE PIPE

ISSUED FOR REVIEW

A	03-03-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 INTRODUCTION

1.1 General

K-Electric Limited (KE) aims to develop a Spur Pipeline to fulfill the gas requirement of the 900 MW RLNG Combined Cycle Power Plant (900MW CCGP).

KE intends to engage an EPC Contractor for laying the Pipeline for supply of 250 MMSCFD RLNG at 85 bar from a suitable point at the RLNG Supplier's main pipeline which is connecting the Bin Qasim Power Station with the Custody Transfer Station, situated at 2 KM approximately. This spur pipeline shall connect the Delivery Point situated at KE's Bin Qasim Power Complex with the Main Pipeline through a tee-off connection as designated by RLNG Supplier in its facility.

This specification gives the minimum requirements for SAW line pipe for K-Electric RLNG Pipeline Project for K-Electric Bin Qasim Power Station.

Pipes manufactured and supplied according to this specification shall comply with API specification 5L (44th Ed. or Latest), "Specification for Line Pipe", as supplemented / amended in this specification.

This specification gives the amendments and supplements to API Specification 5L. The amendments and additional requirements are specified below:

1.2 Definition of Terms

Refer to the Contract Agreement.

1.3 Error or omission

1.3.1 The review and comment by the COMPANY of any drawings, procedures or documents referred to in this Specification shall only indicate acceptance of general requirements and shall not relieve the MANUFACTURER of its obligations to comply with the requirements of the contract.

1.3.2 Any errors or omissions noted by the MANUFACTURER in this Specification shall be immediately brought to the attention of the COMPANY.

1.4 Deviation

All deviations to this Specification and other specifications or attachments listed in the Purchase Order shall be made in writing and shall require the written approval of the COMPANY prior to executing the work.

2.0 BASIC SPECIFICATION REQUIREMENTS

This specification supplements API specification 5L, 44th Edition or Latest, and covers all sizes of API 5L 44th Ed. or Latest PSL 2 welded line pipe in grades B through X-80 inclusive. It is intended as the base line requirements and may be supplemented by OWNER or its representatives.

Pipe shall be manufactured in accordance with the requirements of the API 5L 44th Edition or Latest approved edition of API Spec 5L 44th Edition or Latest PSL 2 requirements, and as supplemented by this specification, including the requisitions, appendices, and the purchase order. This specification shall constitute the OWNER's request for special agreements where they exceed API Spec 5L 44th Edition or Latest PSL 2 requirements. The VENDOR's quotation in conformance with this specification and any supplements shall constitute their agreement to meet all of the requirements in the specification.

The quotation shall state if the order will be distributed between more than one MANUFACTURER, or more than one location of a MANUFACTURER. If a MANUFACTURER has more than one mill in a given location, the quote shall specify which one(s) will be used for this order.

Appendix A of this specification references paragraph 7 of API 5L 44th Edition or Latest and lists OWNER's requirements for the MANUFACTURER/purchaser agreement clauses in paragraph 7.

Test Certificates of pipe shall be furnished and shall conform to paragraph 10.1 of API 5L, 44th Edition or Latest.

Inspection frequency of PSL 2 pipe shall be as per Table 18, API 5L, 44th edition or Latest, unless otherwise specified in this specification.

3.0 PROCESS OF MANUFACTURE

The MANUFACTURER shall provide a controlled copy of the Manufacturing Procedure Specification (MPS) and a Manufacturing Quality Plan (MQP) that is customized to meet the requirements of the purchase order and this specification.

The MANUFACTURER's quotation shall state whether pipe supplied is suitable for induction bending. Detailed requirements shall be specified in the MPS and QCP at the time of quotation.

All steel shall be fully killed, fine grain and treated for inclusion shape control. Quenched and tempered pipe is not permitted.

3.1 Submerged Arc Welded Pipe

A qualification test is required at the start of production. A minimum of four joints from four different heats consisting of at least one from each welding line shall be subjected to all of the mechanical tests, chemistry requirements, and non-destructive examinations in this specification.

4.0 MATERIAL REQUIREMENTS

4.1 Chemical Properties

The product chemical composition shall meet the requirements of Table 5, API 5L 44th Edition or Latest except for the following:

Carbon (C)	0.17% max.
Manganese (Mn)	1.70% max*
Silicon (Si)	0.45% max.
Sulphur (S)	0.015% max
Phosphorous	0.025% max
Carbon Equivalent (ICW)	0.40% max. (0.43% specified)
Carbon Equivalent (Pcm)	0.22% max. (0.25% specified)
*The maximum allowable manganese content is that listed in API 5L 44 th Ed. or Latest, Table 5. Manganese content increases based on carbon content are not permitted.	

4.2 Tensile Testing

One tensile test specimen shall be taken in the longitudinal direction at the same frequency as in API 5L 44th Ed. or Latest PSL 2 control tests and shall meet the requirements of API 5L 44th Ed. or Latest PSL 2 except that longitudinal tensile strength may be 5% less than the required values in the transverse direction.

The maximum yield/tensile strength ratio shall be 0.93 on transverse tensile specimens and 0.93 on longitudinal tensile specimens. Both ratios must be met.

4.3 Charpy Impact Tests

Charpy impact tests shall be performed in accordance with API 5L 44th Ed. or Latest, Para 9.8. The test temperature shall be 0°C (32°F).

The average and minimum shear values shall be according to API 5L, with test temperature 0°C (32°F).

4.4 SAW Welded Pipe

The weld metal, and the heat affected zone shall also be tested. The manufacturer shall have a procedure referenced in the information requested in Section 3.0 for removing and notching the specimens at the weld line.

A drop weight tear test shall be performed in accordance with API 5L 9.9 and Table 18 at a temperature of 0°C (32°F).

4.5 Hardness Tests

The hardness test requirement shall be over and above para 10.2.5.3 of API 5L, 44th edition or Latest.

The qualification test procedures referred to in Section 3.0 shall include hardness tests on the weld seam, heat affected zone and the pipe body. Hardness readings shall be 275 HV10 max.

Figure 1A shows the locations and number of hardness indentations for SAW pipe

Base metal hardness tests shall be performed on the tensile test coupons for production pipe at the same frequency of the tensile tests. Hardness shall not exceed 260 BHN or equivalent. If a failure occurs, two additional pipes from that

heat shall be tested and both shall pass the test. If both pass the entire heat may be accepted. Except for the joint which failed the test, if either re-test fails, the heat shall be rejected, the cause of failure shall be investigated and the notified to the Company.

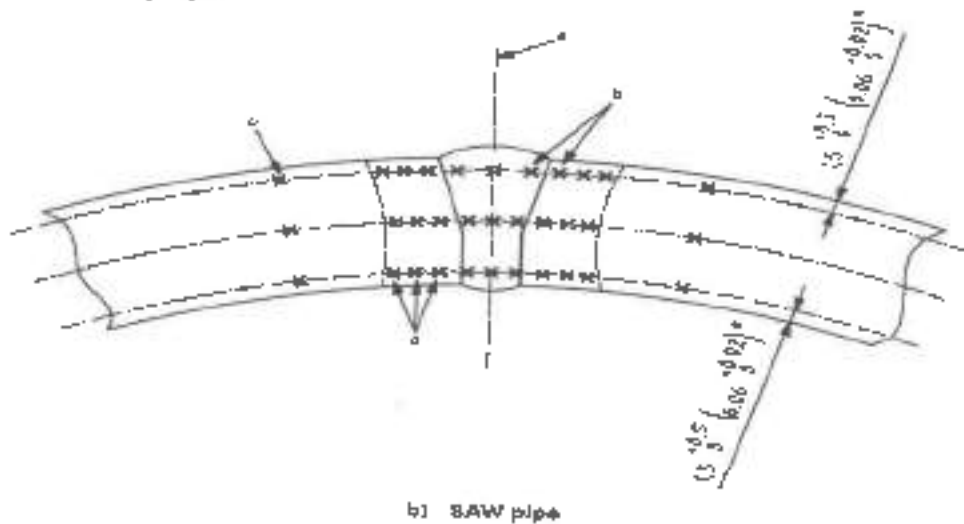


Figure 1A

5.0 HYDROSTATIC TESTS

The hydro test pressure shall be held for a minimum duration of 10 seconds as per Para. 10.2.6.1, API 5L 44th Edition or Latest.

6.0 DIMENSIONS, WEIGHTS, AND LENGTHS

Diameter tapes are prohibited in measuring the diameter of pipe ends for sizes less than 20 inch. Calipers shall be used for measurement of pipe diameters and at least three readings shall be taken on separate planes around the pipe circumference and averaged to provide a value. The frequency in API 5L 44th Ed. or Latest, Para 10.2.8, Table 18 shall apply.

The maximum ovality shall be 1.5% for pipe sizes up to 24 and 1% for sizes greater than 24.

Pipes shall be furnished with ends beveled to an angle of 30 degrees (+ 5 degrees, -0 degrees) and with a root face of 1/16 in, + 1/32 in, -0 in.

7.0 NON DESTRUCTIVE INSPECTION

The MANUFACTURER shall provide their inspection procedures for Owner's approval.

A lamination check shall be made over the whole circumference on each end of each pipe for manufacture for a distance of 25.4 mm (1 in) from the end using a calibrated compression wave ultrasonic procedure. This procedure shall meet the requirements of ASTM E114 and shall be approved by Owner's. The calibration frequency shall be as described in the following paragraphs.

7.1 Submerged Arc Welded Pipe

Nondestructive testing for final acceptance shall be performed on the SAW weld seam after hydrotest and cold expansion per the requirements of API 5L para E 3.2.

A radiological inspection using the X-ray method for a minimum distance of 8 inches from each pipe end is required in accordance with API 5L para. E 3.2.2.

A full length ultrasonic inspection of the weld seam of each pipe is also required per API 5L E.5.

The NDT reference standard for ultrasonic testing shall be per API 5L E.5.2 except that it shall contain OD and ID longitudinal and transverse notches and a drilled hole. Unless otherwise specified NS notches and a 1.59 mm (1/16 in) diameter hole are required for the reference standard.

A dynamic calibration at production speed using the reference standard is required. Calibrations shall be done as a minimum at the start of each shift, at 4 hour \pm 15 minute intervals and before the nondestructive unit is turned off. If the latter calibration check shows that the accuracy of the calibration has shifted outside of the acceptable range, all lengths of pipe inspected since the last good calibration shall be re-inspected using the same nondestructive method previously used.

If necessary to meet the full length (100%) inspection requirements noted in E.3.1.1 pipe ends shall be inspected by using hand held ultrasonic shear wave equipment or cut off. Calibration frequency shall be as noted above.

8.0 WORKMANSHIP, VISUAL INSPECTION, REPAIR OF DEFECTS

Where the depth of a surface imperfection is not readily apparent, suitable non-destructive examination methods and surface grinding shall be performed to assure that the depth of the imperfection is completely removed. When the surface is ground to remove a surface imperfection, complete removal shall be verified by magnetic particle examination and the

remaining wall thickness measured by UT as per Para. E.3.2, API 5L 44th Ed. or Latest to assure it meets or exceeds minimum API allowable requirements of Table 9, API 5L 44th Ed. or Latest Tolerances for Wall Thickness.

Residual magnetism shall be less than or equal to 15 Gauss measurement shall be in accordance with Para. F.7, API 5L 44th Ed. or Latest requirements.

9.0 MARKING AND TRACEABILITY

Marking shall be according to Para 11, API 5L 44th Ed. or Latest Low stress stamping for traceability on bevel face only is allowed. They will be removed during weld preparation prior to welding of the joint.

Pipe number shall be traceable back to coil or plate.

10.0 SHIPPING

Pipe shall be bare and free of oil, grease, lacquer, antifreeze (from UST couplant) and other contaminants such as chlorides which adversely affect coating adhesion. It is permissible to apply mill varnish over the stencil identification to minimize deterioration of this marking.

No hooks or handling devices with copper or copper alloys may be used. No over stowage or deck loads are permitted.

If in-transit fatigue cracks are detected after shipment, OWNER reserves the right to reject the entire shipment until an absence of fatigue cracking is proven on the entire shipment by an agreed upon NDE method.

Bevel end cap protectors shall be used unless otherwise specified.

11.0 WARRANTY

OWNER shall be reimbursed for replacement costs of any pipe furnished that fails under field hydrostatic test, damage to the pipe in transit to the point of delivery, defects of materials, workmanship, or lack of compliance with this specification. Such tests shall be applied at the time of construction and before the pipe is placed into service. The replacement costs shall include pipe, labor, and equipment rental for locating, cutting out, replacing and testing the pipeline.

APPENDIX - A

The following tables list the information required by API 5L 44th Ed. or Latest to be supplied by the Contractor. The pipe shall conform to these requirements unless otherwise agreed upon by the Owner.

Section 1. API 5L 44 th Edition or Latest: Information Required:	API Par. Table #	OWNER Requirements for Welded Line Pipe
Specification	API 5L 44 th Ed. or Latest	Listed on purchase order or data sheet
PSL (Product Specification Level)	Table 2 & 3	PSL 2
Grade	9.2 Table 5 & 7	Refer material requisition
Type of Pipe	Table 2	SAW for 18" Pipe
Outside diameter	9.11.1.2	Refer material requisition
Wall thickness	9.11.1.2	Refer material requisition
Nominal Length	9.11.3.3 & Table 12	40 ft
End finish	9.12.1.2	Plain end
Delivery date and instructions		As indicated on Purchase Order
Inspection		OWNER representative & 3 rd party inspection and Pipe Mill
Design code		ASME B 31.8

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Section 2. API 5L 44 th Ed. or Latest: Optional	API Par. Table #	OWNER Requirements for Welded Line Pipe
Certificate of Compliance with test results	Para 4	Required
Cold or non expanded	8.9	Either is acceptable but 1.5% max if expanded.
High Carbon Equivalent	Table 5	Not permitted
Test type	9.8	Full size, or 2/3 size or tapered specimen per Para 9.8 whichever gives larger thickness of test specimen. MANUFACTURER shall state what type of specimen will be used.
Temperature		32 F max. Required by PSL 2 and this specification.
Charpy Energy values		Use G.3 for testing and Table 8 values.
Jointers	8.11	Not permitted
Reduced negative tolerances	9.14 & Table 11	Negative tolerance restricted to 7.5%.
Alternative levels	9.12.5	Refer Clause 6.0
Special inspection of SAW seams	10.2.1.2 & Table 18	Final inspection by UT if wall t > 0.188
Type of Penetrameter for Radiography	E.4	No preference
Bare pipe special coatings	12.1	Refer Material Requisition
Special NDE for laminations	K.4.2	Inspection required.
Demo of capability of Magnetic particle inspections	E.6.3	Not required
Purchaser inspection		Required
Inspection Location		At Pipe Mill
Monogram Marking	Annex O	Per API 5L, 44 th Edition or Latest

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Section 3. API 5L 44 th Ed. or Latest: Mandatory Agreements	API Par. Table #	OWNER requirements concerning mandatory agreement clauses listed below.
Alternative heat treatment for SAW		Not permitted
Coil end welds at pipe ends		Not permitted
Chemical composition	Table 5	By agreement on elements other than specified in Table 5.
Charpy Specimen size	Table 22	Full size or tapered per 10.2.3 whichever gives larger thickness
Type of Notch for drop weight tear test	10.2 4.4	MANUFACTURERs standard unless otherwise specified. Manufacture shall advise.
Internal diameter tolerance	9.11	Diameter tape not permitted
Coil end welds at jointer welds	8.11	Not permitted
Alternative NDE for SAW seam ends		Not allowed
Alternative penetrometer for radiological inspection	E.4	No alternative allowed without approval of Owner.
Length tolerances applied to cartloads.	9.14 & Table 12	Tolerance applied to each car load.
NDT for repair of pipe body by welding	D.2.1.2	Repair of pipe body defects is not allowed

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K-ELECTRIC

Energy That Moves Life

K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR 3LPE COATING OF LINE PIPE

**ISSUED FOR
REVIEW**

A	02-03-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 GENERAL

1.1 Scope

This specification covers the supply and application of 3-layer polyethylene (3LPE) Corrosion Protection Coating on steel pipe API 5L Gr. X 63, 10.312 mm thk. The coating shall consist of three layers:

- Fusion Bonded Epoxy (FBE)
- Copolymer Adhesive
- High Density Polyethylene (HDPE)

The 3 layer PE coating shall meet the requirements of ISO 21809-1: 2011 coating class B and this specification.

The work includes the furnishing of all labor, materials (except line pipe), tools and equipment and the performance of all operations and incidentals necessary for the coating, handling, storing and shipping of coated line pipe.

1.2 Definitions

Refer to the Contract Agreement.

1.3 Environmental Data

Refer to Design Basis Document No. 255-8-DER-001

1.4 Errors or Omissions

1.4.1 The review and comment by the COMPANY of any drawings, procedures or documents referred to in this Specification shall only indicate acceptance of general requirements and shall not relieve the VENDOR of its obligations to comply with the requirements of the contract.

1.4.2 Any errors or omissions noted by the VENDOR in this Specification shall be immediately brought to the attention of the COMPANY.

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1.5 Deviations

All deviations to this Specification and other specifications or attachments listed in the Purchase Order shall be made in writing and shall require the written approval of the COMPANY prior to executing the work.

1.6 Reporting Procedure

A full reporting and recording system, to be agreed with the COMPANY, shall be implemented and maintained throughout the duration of the Purchase Order.

1.7 Pipe Bending

The pipe will be bent in the field to the following radii:

18" NPS	-	27 pipe diameters
20" NPS and larger	-	30 pipe diameters

The VENDOR shall confirm that the radius for cold bending the completed coated pipe can be achieved without loss of integrity.

2.0 CODES, STANDARDS AND SPECIFICATIONS

All materials and equipment supplied and work performed under this Specification shall conform to the latest edition of the industry standards, codes, references and recommended practices listed below:

ISO 21809-1: 2011	External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 1: - Polyolefin Coatings (3-layer PE and 3-layer PP)
ISO 21809-1: 2011	External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 2: - Fusion Bonded Epoxy coatings
ASME B31.8	Gas Transmission and Distribution Piping Systems
ISO 9000/9001/9002	Quality Systems
API Spec 5L	Specification for Line Pipe

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API RP 5L1	Recommended Practice for Railroad Transportation of Line Pipe
API RP 5L5	Recommended Practice for Marine Transportation of Line Pipe
ASTM E 337	Test for Relative Humidity by Wet And Dry Bulb Psychrometer
ASTM G8	Cathodic Disbonding of Pipeline Coatings
NACE RP-02-74	Recommended Practice. High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
NACE RP-01-88	Discontinuity (Holiday) Testing of Protective Coatings
SSPC-PA-2	Measurement of Dry Paint Thickness with Magnetic Gauges.
SSPC-SP-1	Solvent Cleaning
SSPC-SP-10	Mechanical Cleaning

3.0 QUALITY PROGRAM

A quality control program shall be submitted to the COMPANY for review and approval prior to first production. The program shall be in accordance with ISO 9000/9001/9002 as the appropriate standard.

The quality program shall, as a minimum, include the following:

- a) Raw material handling procedures
- b) Raw material testing
- c) Coating application procedures
- d) Inspection and testing procedures
- e) Inspection and testing equipment calibration
- f) Coating repair procedure

- g) Handling and stockpiling
- h) Personnel qualification

4.0 **DESIGN REQUIREMENTS**

- 4.1 The 3LPE coating shall be capable of withstanding a maximum continuous operating temperature (i.e. design temperature) of 50 °C. It shall meet the requirements of ISO 21809-1:2011 and this specification.
- 4.2 The 3LPE shall be capable of withstanding the cyclic operating temperature range between 5 °C and 50 °C for the complete design life.
- 4.3 The 3LPE coated pipe will be installed using conventional lifting and laying equipment.
- 4.4 The axial bond between the FBE, Adhesive, and outer HDPE jacket shall be adequate to withstand the shear forces that may be inflicted during the course of transportation and installation.
- 4.5 VENDOR shall at the time of bidding state and guarantee the maximum interfacial shear stresses between FBE/Adhesive, HDPE before failure can occur on the coated pipe for evaluation and acceptance by the COMPANY.

5.0 **QUALIFICATION REQUIREMENTS**

5.1 **General**

The coating procedure shall address the following points as a minimum:

- Line pipe handling, storage and inspection at all stages of application work.
- Complete details of the coating materials together with quality control, storage of materials, Manufacturer's certification and safety sheets.
- Application of FBE coating, intermediate copolymer adhesive, and outer HDPE coating, including details of thickness, density, bonding strengths and details of application equipment.
- Inspection and testing including instrument and equipment types, frequency and acceptance criteria.

- Details of instrument and equipment calibration methods including relevant standards and examples of calibration certificates.
- Complete details of inventory of laboratory and testing equipment.
- Quality control procedures including documentation, batch identification and qualification of personnel for all aspects of the work.
- Coating repair procedures and acceptance criteria for repair and rejection.
- First day production Tests.
- Field testing.

5.2 Coating Procedure Specification

- 5.2.1 A detailed coating procedure shall be prepared by the VENDOR for qualification and COMPANY's approval.
- 5.2.2 The coating procedure shall be qualified by coating five pipe lengths in strict accordance with the coating procedure and this Specification.
- 5.2.3 The VENDOR may use first day production tests for purposes of qualification.
- 5.2.4 The VENDOR shall submit certified records of all aspects of the qualification procedure to the COMPANY for approval.
- 5.2.5 Any failure to meet any part of the qualification procedure shall require the VENDOR to revise the procedure and repeat the qualification process.

6.0 MATERIALS

- 6.1 The FBE material shall be a fast gel time material and shall meet the following requirements:
 - 6.1.1 As-applied thickness: > 250 microns.
 - 6.1.2 The FBE materials shall meet the requirements of Appendix-A.
- 6.2 The copolymer adhesive shall meet the following requirements:

- 6.2.1 As-applied thickness: > 250 microns.
- 6.2.2 The adhesive shall meet the requirements of Appendix-B.
- 6.3 The polyethylene material shall be of High Density and shall meet the following requirements:
 - 6.3.1 As applied thickness: >2.7mm.
 - 6.3.2 The PE shall meet the requirements of Appendix-C.
- 6.4 The complete 3LPE coating shall meet the following requirements:
 - 6.4.1 As applied thickness: >3.2mm.
 - 6.4.2 The applied coating system shall meet the requirements of Appendix-D.

7.0 COATING APPLICATION

7.1 Surface Preparation

The steel surface shall be prepared as follows and meet the requirements of Appendix-E.

Initial Preparation

Before coating, all dirt and contaminations, such as oil and grease shall be removed, by a suitable solvent or biodegradable detergent, prior to abrasive blasting in accordance with the requirements of SSPC-SP1. The pipe surface shall be cleaned from all dust and foreign matter using clean dry compressed air or vacuum cleaning. Cleanliness of the compressed air shall be tested with a blotter test and shall be free of any trace of oil. Blast cleaned pipes shall be coated within 4 h and the surface cleanliness shall remain to be Sa 2.5. Pipes whose coating is delayed beyond this period, or pipes showing any visible rust stains, shall be blast cleaned again. During coating, the beveled ends of the pipes and the pipe bore shall be protected against mechanical damage and against contamination with coating material.

Uncoated pipe ends shall receive a temporary protective coating for transit. All pipes shall be dry prior to entering the abrasive blast cleaning cabinet. Pipe surface temperature shall be at least 3°C above the dew point prior to abrasive blast cleaning as per Code ISO 21809-1.

Under no circumstances shall the total elapsed time from the start of cleaning to the application of coating exceed the following time humidity table:

<u>Relative humidity %</u>	<u>Time hours</u>
90	1
85	2
80	4
70	10

Abrasive Blast Cleaning

The abrasives shall meet the requirements of ISO 11124.

The pipe surface shall be cleaned of mill scale, rust and other foreign matter by an abrasive blast cleaning method to achieve a minimum surface cleanliness of Sa 2½. The surface profile shall be as specified by the epoxy coating Manufacturer. If not specified, the surface profile shall be 2-4 mil (50-100 µm) to be measured in accordance with the requirements of ISO 8503-4 (digital stylus profilometer, Rz, with a cut off length of 2.5 mm) in the coating plant and with ISO 8503-5 (Replica Tape) in the field. During blast cleaning the pipe surface temperature shall be simultaneously higher than 5 °C and more than 3 °C above the dew point. In the field operation, the relative humidity shall also be less than 85%. Immediately after blast cleaning, all remaining weld splatter, lamination and irregularities shall be removed from the pipe surface by grinding. The maximum allowable area of grinding shall be 10 cm² per meter of pipe length or 0.5% of pipe surface area, whichever is lower. Any treated surface with an area larger than these limits shall be re-blasted to the cleanliness and roughness as specified above.

Surface Dust Contamination

The dust level on the blast-cleaned surface shall be of Class 1 for both size and quantity in accordance with ISO 8502-3.

Surface Cleanliness and Pre-treatment

The blast cleaned pipe surfaces shall be pre-treated with phosphoric acid in accordance with the specification of the manufacturer. Additional chemical treatment by chromate shall be optional taking into consideration local and international HSE regulations. The maximum residual chloride level on the blast-cleaned surface shall be 20 mg/m².

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Potable Water

The water used for washing shall be tested for dissolved solids, chlorides and pH. Acceptance criteria shall be maximum 200 ppm dissolved solids, 50 ppm chlorides and pH value of 6.5 to 8.0.

7.2 FBE Application

The application of the coating shall be strictly in accordance with the coating Manufacturer's application procedures. During the application of the coating system, the pipe preheating temperature shall be monitored and recorded using contact pyrometers. The FBE DFT shall be in accordance with the specification.

The FBE coating shall be applied to the preheated pipe in a uniform manner by electrostatic powder spray to produce the specified thickness.

In no event shall the percentage of recycled powder mixed with new powder exceed 25 percent.

The FBE coating shall be applied over the full length of each pipe.

Frothing of the coating at the steel/coating interface shall be avoided.

All compressed air used for delivery of FBE in the coating chamber shall be free from moisture, oil and other contaminants.

7.3 PO Adhesive Mid-coat Application

For multi-layer systems, the temperature and time between subsequent layers shall be controlled to obtain sufficient interlayer adhesion.

The copolymer adhesive shall only be applied after the FBE is fully cured and inspected in accordance with Section 8.0.

The FBE cutback shall be taped to prevent the adhesive from adhering to the cut back during foam coating. The cut back in the adhesive layer shall be 100 mm.

The copolymer adhesive shall be applied to give a uniform layer of the specified thickness. The method of application shall be specified by VENDOR for review and acceptance by the COMPANY.

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7.4 FO Topcoat Application

A HDPE topcoat shall be applied over the copolymer adhesive and provide a waterproof barrier capable of withstanding external hydrostatic pressure to water depths of upto 20 m.

The HDPE outer coating shall provide the balance thickness of the coating system and shall be able to withstand impact without deterioration of HDPE coating during backfilling of the trench after installation.

The cutback shall 150 +0/-20 mm and square to the pipe axis.

The applied HDPE topcoat shall be cooled to a temperature which prevents handling damage during finishing and final inspection. Batches of polymer shall be used in the same sequential order in which they were manufactured.

8.0 INSPECTION AND TESTING

Pipes Surface Preparation shall be inspected as per Appendix-E.

Pipe coating shall be inspected as per Inspection Plan detailed in Appendix-F.

9.0 COATING REPAIRS

9.1 General

9.1.1 The VENDOR shall submit a repair procedure for the approval of the COMPANY prior to the start of production.

9.1.2 The VENDOR shall demonstrate that the repair is as strong as the parent material.

9.1.3 Where a pipe is to be stripped and re-coated, the pipe shall in no circumstances be heated to above 246 °C.

9.2 Field Repair of Coating

9.2.1 The Vendor shall include in his bid a comprehensive procedure for field repair of coating, and specifications of all the repair materials involved.

9.2.2 Vendor shall include in his supply, repair materials to adequately cover the coating damage normally expected during transportation.

9.3 Repair of Bare Pipe

9.3.1 Scratches, grooves, gouges and silvers may be removed by filling or grinding, in accordance with procedures approved by the COMPANY.

9.3.2 The VENDOR shall grind or otherwise repair damaged bevels and pipe found to have been damaged, in accordance with the Line Pipe Specification.

9.3.3 All ends of pipe which are damaged to such an extent that they cannot be repaired by grinding or filing shall be re-beveled by the VENDOR.

9.3.4 The VENDOR shall furnish a beveling machine for repair of the pipe ends.

9.4 Repair of Coating

9.4.1 Areas of pipe requiring small spot repairs shall be cleaned to remove dirt, scale and damaged coating using surface grinders or other suitable means. The adjacent coating shall be feathered. All dust shall be wiped off. For pinholes only, surface preparation is not required other than removing surface dirt, oil, grease and other detrimental contaminants which impair the adhesive of the repair material. Minor defects upto 100mm in length and 1cm² in size shall be repaired using PE melt sticks.

9.4.2 Pipes with larger damage upto 300mm in length and 100sq.mm may be repaired with a heat shrink sleeve.

9.4.3 Pipes with larger coating defects such as uneven coating, disbonding or inadequate film thickness shall be set aside for stripping and re-coating. All repairs shall be re-subjected to the original acceptance criteria.

9.4.4 When stripping a pipe for re-coating the pipe shall not be heated above 246 °C.

9.4.5 For all defects in which the FBE layer is exposed, a two part liquid epoxy compound shall be applied using a hand gun applicator. The defect area must be first abraded by hand using a carborundum cloth. The compound

shall be applied to a minimum thickness of 100 micron above the specified FBE thickness and overlap the undamaged area by 25 mm.

- 9.4.6 Pipe having major coating defects (e.g. partially coated, disbonding or inadequate film thickness) shall be set aside for reprocessing.

10.0 IDENTIFICATION AND MARKING

- 10.1 The pipe will be delivered to the **VENDOR** marked in accordance with the marking system. The **VENDOR** shall maintain the pipe identification throughout the process of cleaning and coating of the pipe. If the pipe identification is removed during the coating operation, it shall be replaced.
- 10.2 Additional markings shall be applied 50 mm from the end of the coating and outside the pipe at each end. Letters and numerals shall be 25 mm in height.
- 10.3 Pipe which has undergone repair in accordance with section 9.0 shall be marked with a band painted around the entire circumference of the coated pipe and not more than 75 mm from the cut back at each end.
- 10.4 All markings shall be stenciled and spray applied with a paint compatible with the coating material and of a contrasting colour.

11.0 STORAGE, HANDLING AND SHIPPING

- 11.1 The coated pipe shall at all times be handled in a manner to avoid damage to the coating.
- 11.2 The coated pipe shall be supported only by the uncoated ends until the coating has cooled to ambient temperature.
- 11.3 The coated FBE shall be stored in an area which will not result in accumulation of dust or dirt either from the environment or surrounding.
- 11.4 The FBE coated pipe shall be protected to avoid degradation from ultraviolet light radiation.
- 11.5 Any coated pipe section that shows contamination in any form whatsoever from the environment or surrounding shall be adequate grounds for stripping the entire coating and completely re-coating the pipe as considered appropriate by COMPANY's representative.

11.6 All coated pipe which has undergone repair shall be stockpiled separately from non repaired pipes or shall be colored coded for ease of identification.

11.7 The handling and shipping of coated and uncoated pipe shall be in strict accordance with the applicable Specifications. VENDOR shall ensure that all coated pipe is loaded into containers and is in accordance with procedures approved by the COMPANY.

12.0 DOCUMENT SUBMITTALS

12.1 The VENDOR shall submit copies each of the following documents to the COMPANY as set forth below:

<u>Document</u>	<u>Submittal</u>	<u>No. Copies</u>
Quality Control and Application Procedures	With Bid	2
Coating Repair Procedures	With Bid	2
<u>Document</u>	<u>Submittal</u>	<u>No. Copies</u>
Storage, Handling and Transportation Procedures	Prior to Coating	2
Qualification Test Report	Prior to Coating	2
Certified Material Test Certificates	Prior to Coating	2
Certified Inspection Report	Weekly	1
Tally Recorded of Pipe Received	Weekly	1
Tally Recorded of Pipe Coated/Loaded Out	Prior to Shipping	6
Coating Repairs Undertaken	Reported Daily	1

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All certificates shall be in English language and with SI units of measure. Certificates shall be visibly signed by the **VENDOR**.

- 12.2 The **VENDOR** shall maintain a complete record of the pipe from the time it first enters the coating yard until the completion of load-out of coated pipe. Pipe joint length and date of the coating application shall be recorded for each joint of pipe. The **VENDOR** shall provide this information to the **COMPANY** according to the schedule specified above.

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APPENDIX A: REQUIREMENTS FOR EPOXY POWDER (FBE)

Properties	Unit	Test Method	Requirements
Moisture content	% by mass	ISO 21809-2	≤ 0.6
Minimum glass transition temperature (T _g)	°C	ISO 21809-2	≥ 95 and within manufacturer's specifications
Gel time at 205 \pm 3 °C	seconds	ISO 21809-2	Within 20% of nominal value specified by manufacturer
Density	g/cm ³	ISO 21809-2	Within ± 0.05 of the manufacturers specified nominal value

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APPENDIX B: REQUIREMENTS FOR ADHESIVE

Properties	Unit	Test Method	Requirements
Elongation at break at $23 \pm 2^\circ\text{C}^a$	%	ISO 527-2 or ISO 527-3	≥ 600
Tensile yield strength at $23 \pm 2^\circ\text{C}^a$	MPa	ISO 527-2 or ISO 527-3	> 8
Vicat softening temperature A/50 (9.8N)	$^\circ\text{C}$	ISO 306	≥ 85
Water content	%	ISO 15512	≤ 0.1
^a 2 mm thick compression moulded sheet, test specimen type according to ISO 527-2, strained at 50 mm/min			

APPENDIX C: REQUIREMENTS FOR PE TOPCOAT

Properties	Unit	Test Method	Requirements
Density	g/cm ³	ISO 1183	> 0.940
Elongation at break at 23±2 °C ^a	%	ISO 527	≥ 600
Tensile Yield strength at 23±2 °C ^a	MPa	ISO 527	≥ 15
Vicat softening temperature N/50 (9.8N)	°C	ISO 306	≥ 110
Water content	%	ISO 15512	≤ 0.05
Oxidation induction time (intercept in the tangent method)	min	ISO 11357	≥ 30 at 210°C ≥ 10 at 220°C
UV resistance and thermal ageing	%	ISO 21379-1	ΔMFR ≤ 35
Hardness	Shore D	ASTM D2240	≥ 60
Stress Cracking Resistance	hours	ASTM D 1693	≥ 300
Moisture absorbency	%	ASTM D 1693	≤ 0.01

^aPreparation of the test specimen according to ISO 1872-2 for PE, at 50mm/min crosshead speed.

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APPENDIX D: REQUIREMENTS FOR COMPLETE COATING

Properties	Unit	Test Method	Acceptance Criteria PE	Frequency Qualification	Frequency Production
Continuity		Visual & ISO 21809-1	free of defects and discontinuities, delaminations, separations and holidays.	each pipe	Each pipe
Impact strength at 23±3 °C	J/mm	ISO 21809-1	>7	3 pipes	One of 100 pipes (min. one pipe per shift)
Indentation at 23±3 °C at Max design temperature	mm	ISO 21809-1	< 0.2 ≤ 0.4	once	one of 100 pipes (min. one pipe per shift)
PE Elongation at break at 23±3 °C	%	ISO 527-3	≥ 400	once	one of 100 pipes (min. one pipe per shift)
Peel strength	N/mm	ISO 21809-1	≥ 15 nt 23±3 °C ≥ 3 N/mm at max operating temp	5 pipes	every 4 h
Degree of cure of FBE (1 st layer) Δ Tg	°C	ISO 21809-1	As per manufacturer's specification and ≤5°C	1st pipe	1st pipe and 1/shift
Product stability during application of PE top layer process	%	ISO 1133	< 20 ΔMFR	once	1st pipe per shift
Average radius of cathodic disbondment at: 23±3 °C, -1.5 v, 28 days (qualification) 65 °C/24h/-3.5v (QC test in production) 95 °C temp, -1.5 v, 28 days (qualification)	mm	ISO 21809-1	≤ 7 ≤ 7 ≤ 15	once	1/day
Flexibility		ISO 21809-1	No cracking at angle of 2° per pipe diameter length	once	No test
Hot water immersion test	mm	ISO 21809-1	@80°C, 28 days Average ≤5mm	once	No test
Hot water immersion test		ISO 21809-1	@80°C, 48 Hrs. Average ≤2mm and maximum ≤3mm	once	1/day

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APPENDIX E: SURFACE PREPARATION

Properties	Test Method	Requirements	Frequency (Qualification)	Frequency (Production)
Surface condition before blasting	Visual inspection	free of contaminations	each pipe	each pipe
Environmental conditions	Calculation	as determined at time of measurement	once	every 4 h
Pipe temperature before blasting	Contact Pyrometer	Minimum 3°C above the dew point	once	every 4 h
Size, shape and properties of abrasive	Visual + certification ISO 11124 (ISO 11126 (non-metallic))	conformity to certificate, compliance to manufacturing/ working procedures	once	every day
Water soluble contamination of abrasives		Conductivity max. 50 µS/cm	once	every shift
Soluble salt after blasting,	SCM400, or SCM130 ISO 8502-9 and ISO 11127-6	Salt content (as NaCl) max. 20 mg/m ²	One pipe	every 100 pipes or every 4HRS
Surface profile (Rz)	ISO 8503-4 or ISO 8503-5	50 to 100 µm	5 pipes	every 1 h
Cleanliness of blast cleaned surface	ISO 8501-1	Sa 2½	each pipe	each pipe
Presence of dust after dust removal	ISO 8502-3	Max. Level 1	5 pipe	every 1 h
Visual Inspection of pipe prior to coating.	visual	no rust	each pipe	each pipe

APPENDIX F: INSPECTION PLAN

Properties	Test Method	Acceptance Criteria	Frequency Qualification	Frequency Production
Temperature of extruded adhesive and polyolefin, °C	Thermo meter	compliance to APS	once	every 1 h
Preheating temperature before coating	Thermo meter	compliance to APS	Each pipe	every 0.5 h
FBE DFT	ISO 2808	Min. 250 microns	1st pipe	1/shift
PO adhesive thickness	ISO 2808	Min. 250 microns	1st pipe	1/shift
Degree of cure – 1 st layer	ISO 21809-1	$\Delta T_g = \leq 5^\circ\text{C}$	1st pipe	1st pipe and 1/shift
Appearance & Holiday	ISO 21809-1	free of defects and discontinuities, delaminations, separations and holidays.	each pipe	each pipe
Total thickness of coating	ISO 21809-1	>3.2mm	5 pipes	every 10 pipe
Impact strength at 23± 3 °C	ISO 21809-1	>7J/mm ²	3 pipes	one of 100 pipes (min. one pipe /shift)
Peel strength	ISO 21809-1	≥ 15 at 23± 3 °C ≥ 7 N/mm at max operating temp	5 pipes	every 4 h
Indentation at 23± 3 °C at Max service temperature	ISO 21809-1	≤ 0.2mm ≤ 4.4 mm	once	one of 100 pipes (min. one pipe per shift)
PE Elongation at break at 23 ± 3 °C	ISO 527	≥ 400%	once	one of 100 pipes (min. one pipe per shift)
Average radius of cathodic disbondment at: 23 ± 3 °C, -1.5 v, 28 days (qualification) 65 °C/24h-3.5v (QC test in production) 95 °C temp, -1.5 v, 28 days (qualification)	ISO 21809-1	≤ 7 mm ≤ 7 mm ≤ 15 mm	once	1/day
3LPE Hot water immersion test	ISO 21809-1	@80°C, 28 days. Average ≤5mm	once	No test

Properties	Test Method	Acceptance Criteria	Frequency Qualification	Frequency Production
3LPE Hot water immersion test	ISO 21809-1	@80°C, 48 Hrs. Average $\leq 2\text{mm}$ and maximum $\leq 3\text{mm}$	once	1/day
Flexibility of FBE at $0 \pm 3^\circ\text{C}$	ISO 21809-1	$> 2\% \text{DL}$ pipe diameter length	once	No test
In process degradation of PE	ISO 1133	$\leq 20 \Delta\text{MFR}$	Once	1st pipe per shift
Cutback	Measuring	$150 +0/-20 \text{mm}$	each pipe	each pipe
FBE toe @ cutback	Measuring	Min. 5 mm	each pipe	each pipe
Coating repairs	Visual	No holidays	Once for validation	Each defect

 <p>Zishan Engineers (Pvt.) Ltd. An ISO 9001:2015 certified company, 47/F, Block O, FEU/IS, Karachi-Pakistan Tel: (91-21) 34791145-48 & 34310151-54 Fax: (92-21) 34153430 & 34310156 E-mail: contact@zishanengineers.com, Web: www.zispeengineers.com</p>	Document No.	255-8-SPM-005
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	Date	03-03-2020
	Total Pages (inc front cover)	14



K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
PIPING SPECIFICATIONS**

ISSUED FOR REVIEW

A	03-03-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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K-ELECTRIC LIMITED

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1.0 **SPECIFICATION FOR PIPING CLASS D1**

1.1 **Scope**

This specification defines the materials of construction for main pipeline & piping systems classified as ANSI Class 600# in the services designated below:

1.2 **General**

Service	Natural Gas & Liquid Hydrocarbons
Design Standard and Codes	ANSI B 31.3, ANSI B 31.8 and B 16.5 Latest Editions and Addendum
General Material	Carbon Steel
Primary Flange Rating	ANSI Class 600 RF
Design Pressure/Temperature	102 Harg / -29 to 38 °C (1480 psig / -84 to 100°F)
Design Corrosion Allowance	0.063" (1.6 mm)

2.0 **VALVES**

1.1 **Ball Valves**

VB-1 Ball Valve

- Rating : 800 # ,NPT
- Ends : Threaded Ends as per ANSI B 16.11,B1.20.1
- Style : Bolted body, replaceable seats, regular port, fire safe
- Operator : Lever
- Materials : Body : Steel
- Bolting : Cadmium Plated
- Stem : 13% Cr.
- Seats Seals : Filled Teflon
- Ball : A 216 Gr. WCB 0.5 mm ENP
- Dimensions : Mfr. STD.
- Design and Test : API Std. 598

VB-2 Ball Valve

- Rating : 150 #
- Ends : Raised face flange
- Style : Bolted Body, replaceable seats, regular port, fire safe.
- Operator : Lever
- Materials : Body : A105
- Bolting : Cadmium Plated
- Stem : ASTM A182 F6
- Stem Seals : PTFE/Graphite
- Seats Seals : Viton AED Body Seals: Graphite/Viton
- Ball : A 105/ 350LF-2 + 3 Mil ENP
- Design and Test : ANSI B 16.34

VB-3 Ball Valve

- Rating : 150 #
- Ends : Raised face flange
- Style : Bolted Body, replaceable seats, full port, Trunion Mounted fire safe.
- Operator : Gear
- Materials : Body : A 105
- Bolting : Cadmium Plated
- Stem : ASTM A182 F6
- Seats Seals : Viton AED
- Ball : A 105/ 350LF-2+ 3 Mil ENP
- Design and Test : ANSI B 16.34

VH-4 Ball Valve

- Rating : 300 #
- Ends : Raised face flange
- Style : Bolted Body, replaceable seats, regular port, fire safe.
- Operator : Lever
- Materials : Body : A105
- Bolting : Cadmium Plated
- Stem : ASTM A182 F6
- Stem Seals : PTFE/Graphite
- Seats Seals : Viton AED
- Body Seals : Graphite/Viton
- Ball : A 105/ 350LF-2 +3 Mil ENP
- Design and Test : ANSI B 16.34

VB-5 Ball Valve

- Rating : 300 #
- Ends : Raised face flange
- Style : Bolted Body, replaceable seats, full port, Trunion Mounted fire safe.
- Operator : Gear
- Materials : Body : A 105
- Bolting : Cadmium Plated
- Stem : ASTM A 182 F6
- Seats Seals : Viton AED
- Ball : A 105/ 350LF-2 +3 Mil ENP
- Design and Test : ANSI B 16.34

VB-6 Ball Valve

- Rating : 600 #
- Ends : Raised face flange
- Style : Bolted Body, replaceable seats, regular port, fire safe.
- Operator : Lever
- Materials : Body : A105
- Bolting : Cadmium Plated
- Stem : ASTM A182 F6 Stem Seals : PTFE/Graphite
- Seats Seals : Viton AED Body Seals: Graphite/Viton
- Ball : A 105/ 350LF-2 +3 Mil ENP
- Design and Test : ANSI B 16.34

VB-7 Ball Valve

Rating : 600 #
 Ends : Raised face flange
 Style : Bolted Body, replaceable seats, full port, Trunion
 Mounted fire safe.
 Operator : Gear
 Materials : Body : A 105
 Bolting : Cadmium Plated
 Stem : ASTM A 182 F6
 Seats Seals : Viton AED
 Ball : A 105/ 350LF-2 +3 Mil ENP
 Design and Test : ANSI B 16.34

VB-8 Ball Valve

Rating : 600#
 Ends : Raised face flange
 Style : Bolted Body, replaceable seats, full port, Trunion
 Mounted fire safe.
 Operator : Gear
 Materials : Body : A 105
 Bolting : Cadmium Plated
 Stem : ASTM A 182 F6
 Seats Seals : Viton AED
 Ball : A 105/ 350LF-2 +3 Mil ENP
 Design and Test : API 6D

VB-9 Ball Valve

Rating : 600#
 Ends : Raised face flange
 Style : Bolted Body, replaceable seats, regular port,
 Trunion Mounted fire safe.
 Operator : Gear
 Materials : Body : A 105
 Bolting : Cadmium Plated
 Stem : ASTM A 182 F6
 Seat Seals : Viton AED
 Ball : A 105/ 350LF-2 +3 Mil ENP
 Design and Test : ANSI B 16.34

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VB-10 Ball Valve

Rating	: 1500 #, NPT
Ends	: Threaded Ends as per ANSI B 16.11, B1.20.1
Style	: Bolted body, replaceable seats, regular port, fire safe
Operator	: Lever
Materials	: Body : Steel
Bolting	: Cadmium Plated
Stem	: 13% Cr.
Seats Seals	: Filled Teflon
Ball	: A 182F6a Class 3
Dimensions	: Mfr. Std.
Design and Test	: API 6D

1.2 Check Valves**VC-1 Check Valve**

Rating	: 800 #, NPT
Ends	: Threaded Ends as per ANSI B 16.11, B1.20.1
Style	: Bolted bonnet, swing type, fire safe, renewable seats.
Materials	: Body : A216 WCB
Bolting	: Cadmium Plated
Pin	: 13% Cr.
Packing	: Mfr. Std.
Seats	: A 105 N + Stellite GR 6
Disc	: A216 WCB + A182 F6
Design and Test	: MSS SP-84

VC-2 Check Valve

Rating	: 150 #
Ends	: Raised Face Flange
Style	: Bolted bonnet, swing type, fire safe, seats, renewable seats.
Materials	: Body : A216 WCB
Bolting	: Cadmium Plated
Pin	: 13% Cr.
Packing	: Mfr. Std.
Seats	: A 105 N + Stellite GR 6
Disc	: A216 WCB + A182 F6
Design and Test	: ANSI B16.34

VC-3 Check Valve

Rating	: 300 #
Ends	: Raised Face Flange
Style	: Bolted bonnet, swing type, fire safe. seats, renewable seats.
Materials	: Body : A216 WCB
Bolting	: Cadmium Plated
Pin	: 13% Cr.
Packing	: Mfr. Std.
Seats	: A 105 N + Stellite GR 6
Disc	: A216 WCB + A182 F6
Design and Test	: ANSI B16.34

VC-4 Check Valve

Rating	: 600 #
Ends	: Raised Face Flange
Style	: Bolted bonnet, swing type, fire safe. seats, renewable seats.
Materials	: Body : A216 WCB
Bolting	: Cadmium Plated
Pin	: 13% Cr.
Packing	: Mfr. Std.
Seats	: A 105 N + Stellite GR 6
Disc	: A216 WCB + A182 F6
Design and Test	: API 6D

VC-5 Check Valve

Rating	: 1500 #, NPT
Ends	: Threaded Ends as per ANSI B 16.11, B1.20.1
Style	: Bolted bonnet, swing type, fire safe, renewable seats.
Materials	: Body : A216 WCB
Bolting	: Cadmium Plated
Pin	: 13% Cr.
Packing	: Mfr. Std.
Seats	: A 105 N + Stellite GR.6
Disc	: A216 WCB + A182 F6
Design and Test	: MSS SP-84

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1.3 Gate Valves

VG-1 Gate Valve (with rising stem and stem protector).

Rating	:	Class 800 #, NPT
Ends	:	Threaded Ends as per ANSI B 16.11, B1.20.1
Style	:	OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	:	Handwheel
Wedge/Disc	:	ASTM A 216 Gr. WCB - F60
Materials	:	Body : Forged Steel
Packing	:	Mfr. Std.
Stem	:	13% Cr. S.S
Bolting	:	Cadmium Plated
Seats	:	Hard faced 13% Cr.S.S
Design and Test	:	API Std. 602

VG-2 Gate Valve (with rising stem and stem protector).

Rating	:	Class 150 #
Ends	:	Raised Face Flange
Style	:	OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	:	Handwheel
Wedge/Disc	:	ASTM A 216 Gr. WCB + F60
Materials	:	Body: Cast Steel
Packing	:	Mfr. Std.
Stem	:	13% Cr. S.S
Bolting	:	Cadmium Plated
Seats	:	Hard faced 13% Cr.S.S
Design and Test	:	API Std. 600

VG-3 Gate Valve (with rising stem and stem protector).

Rating	:	Class 150 #
Ends	:	Raised Face Flange
Style	:	OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	:	Gear
Wedge/Disc	:	ASTM A 216 Gr. WCB + F60
Materials	:	Body: Cast Steel
Packing	:	Mfr. Std.
Stem	:	13% Cr. S.S
Bolting	:	Cadmium Plated
Seats	:	Hard faced 13% Cr.S.S
Design and Test	:	API Std. 600

VG-4 Gate Valve (with rising stem and stem protector).

Rating	: Class 300 #
Ends	: Raised Face Flange
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Handwheel
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Cast Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 600

VG-5 Gate Valve (with rising stem and stem protector).

Rating	: Class 300 #
Ends	: Raised Face Flange
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Gear
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Cast Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 600

VG-6 Gate Valve (with rising stem and stem protector).

Rating	: Class 600 #
Ends	: Raised Face Flange
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Handwheel
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Cast Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 600

ABY

VG-7 Gate Valve (with rising stem and stem protector).

Rating	: Class 600 #
Ends	: Raised Face Flange
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Gear
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Cast Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 600

VG-8 Gate Valve (with rising stem and stem protector).

Rating	: 600#
Ends	: Raised Face Flange
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Gear
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Cast Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 600

VG-9 Gate Valve (with rising stem and stem protector).

Rating	: Class 1500 #, NPT
Ends	: Threaded Ends as per ANSI B 16.11, B1.20.1
Style	: OS&Y, bolted bonnet, bolted gland, solid wedge, renewable seats.
Operator	: Handwheel
Wedge/Disc	: ASTM A 216 Gr. WCB + F60
Materials	: Body: Forged Steel
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: API Std. 602

1.4 Globe Valves

VGL-1 Globe Valve with stem protector

Rating	: Class 800 #,NPT
Ends	: Threaded Ends as per ANSI B 16.11,B1.20.1
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
Operator	: Handwheel
Materials	: Body: A216 Gr WCB
Packing	: Mfr. Std.
Stem	: ASTM A 182 F 6
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: MSS SP-84

VGL-2 Globe Valve with stem protector

Rating	: Class 150
Ends	: Raised Face Flanges
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
Operator	: Handwheel
Materials	: Body: A216 Gr WCB
Packing	: Mfr. Std.
Stem	: ASTM A 182 F 6
Bolting	: Cadmium Plated
Seats	: A 105 N + Stellite GR.6
Design and Test	: ANSI B16.34

VGL-3 Globe Valve with stem protector

Rating	: Class 150
Ends	: Raised Face Flanges
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
Operator	: Gear
Materials	: Body: A216 Gr WCB
Packing	: Mfr. Std.
Stem	: ASTM A 182 F 6
Bolting	: Cadmium Plated
Seats	: A 105 N + Stellite GR.6
Design and Test	: ANSI B16.34

VGL-4 Globe Valve with stem protector

- Rating : Class 300
- Ends : Raised Face Flanges
- Style : OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
- Operator : Handwheel
- Materials : Body: A216 Gr WCB
- Packing : Mfr. Std.
- Stem : ASTM A 182 F 6
- Bolting : Cadmium Plated
- Seats : A 105 N + Stellite GR.6
- Design and Test : ANSI B16.34

VGL-5 Globe Valve with stem protector

- Rating : Class 300
- Ends : Raised Face Flanges
- Style : OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
- Operator : Gear
- Materials : Body: A216 Gr WCB
- Packing : Mfr. Std.
- Stem : ASTM A 182 F 6
- Bolting : Cadmium Plated
- Seats : A 105 N + Stellite GR.6
- Design and Test : ANSI B16.34

VGL-6 Globe Valve with stem protector

- Rating : Class 600
- Ends : Raised Face Flanges
- Style : OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
- Operator : Handwheel
- Materials : Body: A216 Gr WCB
- Packing : Mfr. Std.
- Stem : ASTM A 182 F 6
- Bolting : Cadmium Plated
- Seats : A 105 N + Stellite GR.6
- Design and Test : ANSI B16.34

VGL-7 Globe Valve with stem protector

Rating	: Class 600
Ends	: Raised Face Flanges
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
Operator	: Gear
Materials	: Body: A216 Gr WCB
Packing	: Mfr. Std.
Stem	: ASTM A 182 F 6
Bolting	: Cadmium Plated
Seats	: A 105 N + Stellite GR.6
Design and Test	: ANSI B16.34

VGL-8 Globe Valve with stem protector

Rating	: Class 1500 #,NPT
Ends	: Threaded Ends as per ANSI B 16.11,B1.20.1
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats, loose disc.
Operator	: Handwheel
Materials	: Body: A216 Gr WCB
Packing	: Mfr. Std.
Stem	: ASTM A 182 F 6
Bolting	: Cadmium Plated
Seats	: A 105 N + Stellite GR.6
Design and Test	: MSS SP-84

VN-1 Needle Valve with stem protector

Rating	: Class 1500 #,NPT
Ends	: Threaded Ends as per ANSI B 16.11,B1.20.1
Style	: OS&Y, bolted bonnet, bolted gland, renewable seats
Operator	: Hand wheel
Materials	: Body: SS 316 With Teflon Packing
Packing	: Mfr. Std.
Stem	: 13% Cr. S.S
Bolting	: Cadmium Plated
Seats	: Hard faced 13% Cr.S.S
Design and Test	: MSS SP-84

PIPING MATERIAL SPECIFICATION

SYMBOLS
 60° = 45°/15°/45°
 90° = WELDED
 RT = REDUCING TEE BUTT WELD
 BT = EQUAL TEE BUTT WELD
 SMT = SOCKET WELDED
 PAD = 45°/45°/45° CLAMP ON TOP WITH 90° CONNECTION TO BOTTOM
 T = FEMALE TEE & BRANCH SPINACE L.S. END & W.C.
 TOL = THROUGH

RUN SIZE		
1/2	3/4	1
2	3-1/2	4
6	8	10
12	14	16
18	20	24
28	30	36

SIZE	DESC.	SIZE	DESC.	SIZE	DESC.	1/2	3/4	1	2	3	4	6	8	10	12	14	16	18	20	24	28	30	36
1/2"	4 SMLS	1-1/2"	4 SMLS	1-1/2"	4 SMLS	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL	TOL

TEMPERATURE RATING

TEMP	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
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HYDROTEST (DATE D BY)

DATE	BY	DATE	BY
13	13	13	13

DESIGN CONDITIONS

DESIGN PRESSURE	DESIGN TEMP	DESIGN WIND SPEED	DESIGN SEISMIC
100 PSI	100 F	30 MPH	AS PER CODE

CLIENT: K-ELECTRAC LIMITED
PROJECT: BOSP'S RING SPUR PIPELINE PROJECT
DATE: 09/05/2020
PREPARED BY: AK/MMS
CHECKED BY: SH
APPROVED BY: SH

CLIENT: K-ELECTRAC LIMITED
PROJECT: BOSP'S RING SPUR PIPELINE PROJECT
DATE: 09/05/2020
PREPARED BY: AK/MMS
CHECKED BY: SH
APPROVED BY: SH

REVISIONS

NO.	DESCRIPTION
1	ISSUED FOR PERMIT

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NOTES:
 1- ALL FITTINGS THICKNESS SHALL MATCH HEAVIER PIPE THICKNESS
 2- SOCKET WELD SHALL VALUED MULTIPLE IN OPEN POSITION
 3- WASH WITH DRY NITROGEN TO PREVENT DAMAGE TO BEARING SURFACES

SIZE	DESCRIPTION	PIPE	DESCRIPTION	SIZE	DESC.	SIZE	DESC.	TEMP. RATING	HYDROTEST	DESIGN CONDITIONS	CLIENT	PROJECT	DATE	BY
1/2"	4 SMLS	API 5L X 40	AS PER ASTM A-106 (B) OR A53-B (SMLS)	1-1/2"	4 SMLS	1-1/2"	4 SMLS	150-350	100 PSI	AS PER CODE	K-ELECTRAC LIMITED	BOSP'S RING SPUR PIPELINE PROJECT	09/05/2020	AK/MMS
3"	2 SMLS	API 5L X 40	AS PER ASTM A-106 (B) OR A53-B (SMLS)	3"	2 SMLS	3"	2 SMLS	150-350	100 PSI	AS PER CODE	K-ELECTRAC LIMITED	BOSP'S RING SPUR PIPELINE PROJECT	09/05/2020	AK/MMS
14"	FLANGES	ASME B16.5	AS PER ASME B16.5	14"	FLANGES	14"	FLANGES	150-350	100 PSI	AS PER CODE	K-ELECTRAC LIMITED	BOSP'S RING SPUR PIPELINE PROJECT	09/05/2020	AK/MMS

 Zishan Engineers (Pvt.) Ltd. An ISO 9001-2015 certified company. 47/F, Block 6, PECHS, Karnochi Parkman Tel: (92-21) 34393045-48 & 34310151-54 Fax: (92-21) 34503435 & 34010156 E-mail: comunic@zishanengineers.com , Web: www.zishanengineers.com	Document No.	ZSS-0-SPM-007
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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
STEEL GATE, PLUG, BALL AND CHECK VALVES

**ISSUED FOR
REVIEW**

A	03-03-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 SCOPE

- 1.1 This specification covers flanged and welding end steel gate, plug, ball and check valves for use in gas pipeline, pipe work and associated facilities.
- 1.2 All valves shall comply with the requirements of ANSI B16.10.
- 1.3 Valves shall be made in accordance with API STD 6D, Specification for steel gate, plug, ball and check valves (latest edition) and with the requirements of this specification.
- 1.4 Valve size, type, rating, material connection type(s) and, where possible, dimensions for operating mechanisms will be specified on the Purchase order.
- 1.5 Where indicated on the specifications/data sheets, valves shall be actuated.
- 1.6 Requirements for ball valves, laid down in the specification for Mainline Ball Valves, Spec No. 255-8-SPM-009, shall also be applicable.

2.0 DEFINITION

Refer to the Contract Agreement.

3.0 GENERAL SERVICE CONDITIONS

- 3.1 Fluid handled: Regasified Liquefied Natural Gas (RLNG)
- 3.2 Valves may be installed:
 - Underground with dirt cover over the pipe.
 - Underground in covered sump.
 - Above ground unsheltered.
- 3.3 Valve stem may be positioned:
 - Vertically
 - Horizontally

4.0 MATERIAL

- 4.1 Bodies, including end flanges and welding ends, bonnets and covers of valves shall be made of materials conforming to the specifications listed in API STD 6D, and as further specified in this specification.
- 4.2 Material selected for welding ends shall have guaranteed minimum yield strength of not less than to adjacent pipe works.
- 4.3 Material selected for welding shall have a carbon content of 0.20% maximum, 0.02% sulphur maximum and maximum carbon equivalent of 0.43% as determined by the formula:

$$C.E. = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15}$$

- 4.4 Steel castings used for valves bodies shall be of X-ray quality, Class 2, as specified in ASTM Specification E71 'Industrial Radiographic Standards for Steel Casting'.

5.0 DESIGN AND CONSTRUCTION

- 5.1 The design and construction of valves shall comply with the requirements of the latest editions of API Standard 6D, ANSI B16.10 and this specification.
- 5.2 Welding ends shall be beveled for welding to pipe or fittings in accordance with ANSI B31.3, Fig. 327.3.1 unless otherwise specified, and shall be bored to the inside diameters as specified in the purchase order.
- 5.3 Due consideration of difference in SMYS shall be taken when calculating wall thickness at welding ends.
- 5.4 Flanged valve dimensions shall be in accordance with ANSI B16.5 'Steel Pipe Flanges and Flanged Fittings' for sizes 2(inch) to 24 (inch) excluding 22 (inch) size, and in accordance with MSS-SP44 for 22 (inch) and 26 (inch) and above.
- 5.5 Valve operating mechanisms shall be fitted with suitable locking device.
- 5.6 Ball valves greater than 8" size shall be pinion supported.
- 5.7 Plug valves shall be of the lubricated type. Lubrication systems shall be fitted with 'button head' type lubrication fittings. Valves shall be shipped with a lubricant suitable for operation in the specified service conditions. The lubricant shall resist dissolving, gumming, or chemical change in service.

- 5.8 Valves shall be fitted with renewable seats. Welding end Ball valves shall have body configurations which allow complete maintenance of the valve without its removal from the line. Top entry design shall be utilized to meet this requirements. Ball valves shall also be fire safe to appropriate API or BS code.
- 5.9 All welding shall be in accordance with the requirements of ASME Boiler and Pressure Vessel Code, latest edition, sections VIII & IX.
- 5.10 All valves 12" and above shall be provided with pneumatic actuator and mechanical override (hydraulic unit for manual operation) and control system.

6.0 **TESTING**

- 6.1 All valves size 6" and above shall be subjected to a shell hydrostatic pressure test in accordance with API STD 6D requirements. Three certified copies of this chart shall be supplied to the Owner.
- 6.2 Hydrostatic seat tests shall be carried out as required by API STD 6D for gate, ball and plug valves, while the test pressure is on each side of the valve, it shall be operated at least twice to demonstrate satisfactory mechanical operation as well as continued tightness after operation under differential pressure conditions.
- 6.3 Valves shall be subjected to air seat tests in accordance with API STD 6D requirements.
- 6.4 The valve manufacturer shall give sufficient advance notice satisfactory to the Owner of the time and place at which testing is to be performed.

7.0 **INSPECTION**

- 7.1 All welds shall be 100% radio-graphed, to meet the acceptance standards of ASME Boiler and Pressure Vessel Code, Latest Edition, Section VIII.
- 7.2 Where X-ray quality steel casting is specified, records of test shall be furnished to the Owner:

8.0 **DATA AND DRAWINGS**

The manufacturer shall provide the following information:

- Outline dimensions and mechanical details for the valve.

- Number of complete revolutions of hand wheel or other operating device to close or open the valve.
- The maximum permissible torque and the rated torque required to close or open the valve at the maximum pressure differential.
- Actual time to fully open or close the valve.
- Head loss curve and data for the valve.

9.0 **MARKING**

Each valve shall be marked in accordance with API 6D requirements and as may be further specified in the purchase order.

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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
STEEL FLANGES

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1.0 **SCOPE**

This specification covers the manufacture, testing, and inspection of steel pipeline flanges, for use in pipelines and associated installations.

Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B16.5 up to sizes (24") and MSS-SP-44 / ASME B16.47 for sizes (26") and above.

Spectacle blind and spacer & blind shall conform to the requirements of ASME B 16.48 up to sizes (24"). For sizes (26") and above, spectacle blind and spacer & blind shall conform to Manufacturer's standard.

Design and manufacture shall be in accordance with ANSI B 16.5/MSS-SP-44, Steel Pipe Flanges and Flanged Fittings, the relevant ASTM standards, and with the requirements of this specification.

2.0 **DEFINITION**

Refer to the Contract Agreement.

3.0 **GENERAL REQUIREMENTS**

Welding neck/slip-on flanges covered by this specification shall be in the range of nominal sizes as follows:

- Welding neck/slip-on flanges (2" to 24") incl as per ASME B 16.5.
- Welding neck flanges (26" and above) as per MSS-SP-44 / ASME B 16.47
- Blind flanges (2" to 24") incl. as per ASME B 16.48
- Blind flanges (26" and above) incl. as per Manufacturer's Standard

4.0 **TEMPERATURE AND PRESSURE RATINGS**

Class	Operating Pressure	Design Pressure	Test Pressure
600	85 barg	100 barg	150 Barg

5.0 GOVERNING SPECIFICATIONS

All flanges shall be manufactured in accordance with the requirements of the following relevant standards, and as further specified herein:

- ASME B 16.5, latest edition, Steel Pipe Flanges and Flanged Fittings.
- ASME B 16.47, large diameter steel flange.
- MSS-SP-44 , latest edition ,Steel Pipeline Flanges.
- ASTM Standards.

6.0 FLANGE FACINGS

Flanges shall be provided with raised faces unless otherwise specified in the Purchase Order.

7.0 MATERIAL

6.1 The steel used shall be suitable welding quality carbon steel as per ASTM A-105 / MSS-SP-44.

The steel shall be of such quality as to properly respond to the intended heat treatment, and shall be fully killed. Steel shall be made by the open hearth, basic oxygen, or electric furnace processes, and shall be suitable for field welding to other project fittings, flanges and pipe.

6.2 Chemical composition of the steel, as determined by ladle analysis, shall conform with the following:

Carbon	0.20% Max.
Sulphur	0.02% Max.

6.3 The Carbon equivalent shall be determined by formula:

$$C.E. = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

and shall not exceed a value of 0.42% on check analysis.

8.0 TENSILE PROPERTIES

In order to provide satisfactory transitions of flange hubs to adjacent pipework, materials of sufficiently high yield strength shall be selected.

9.0 HEAT TREATMENT

All flanges shall be furnished in the heat treated condition.

Details of the heat treatment employed shall be reported on the manufacturers material test certificates.

10.0 DIMENSIONS

10.1 All flange dimensions shall be in accordance with the requirements of the relevant standards.

10.2 All flanges furnished to this specification shall be supplied with hub inside diameter uniformly bored to suit dimensions of matching pipe and shall not exceed $1.5 \times t$, where t is the run pipe thickness at the bevel of welding ends.

11.0 INSPECTION, NON-DESTRUCTIVE TESTING, REPAIR OF DEFECTS

11.1 Flanges shall be examined internally and externally for surface defects.

11.2 Repair by welding of injurious defects shall not be permitted after final heat treatment.

11.3 All flanges shall be subject to inspection at Suppliers works by the Owner or his representative.

12.0 MARKING

Marking shall be in accordance with the requirements of the relevant specifications and as may be further specified in the purchase order.

13.0 CERTIFICATION

The Supplier shall furnish test certificates covering all tests carried out and shall certify compliance with relevant specifications.

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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
MAINLINE BALL VALVES**

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1.0 SCOPE

- 1.1 This specification establishes the technical manufacturing requirements for mainline valves with manual or power operators.
- 1.2 All valves shall conform to API Standard 6D, latest edition, and as hereafter specified.

2.0 DEFINITION

Refer to the Contract Agreement.

3.0 DESIGN DETAILS

- 3.1 Pipeline valves shall be full bore, trunion mounted, spherical ball valves and shall be designed to pass cleaning and batching pigs.
- 3.2 The medium to be handled by the valves will be natural gas of the characteristics defined in the tender document.
- 3.3 The valves and operators shall be suitable for below-ground or above-ground installation in the vertical or horizontal position for operation with ambient temperature ranging from 3 °C to +50 °C.
- 3.4 The valves shall be flanged as per requirements in accordance with ANSI D16.5 for sizes 2(inch) to 24 (inch).
- 3.5 Ball valves 18" or larger shall have body configurations which allow complete maintenance of the valve without its removal from the line. Top entry design shall be utilized to meet this requirement. Ball valves shall also be fire safe to appropriate API or BS code.
- 3.6 The valves shall be designed in such a manner as to insure that failure, due to malfunctioning of operators or their controls, shall take place in the operator gear train and that such parts be replaceable without requiring the removal of the stem bonnet.
- 3.7 Valves with manual operators shall be designed to provide for mounting power operator at a later stage.
- 3.8 If not specified otherwise in the purchase order, power operators shall be furnished in accordance with manufacturer's specifications as approved by the Owner. These specifications, including proof testing shall be considered a part of this specification.
- 3.9 A spoked type, side mounted hand wheel is required on all power operated valves.

The valves shall be so designed that operation under full pressure can be accomplished by one man. Furthermore, means shall be provided for operation of the valves with manual operators with auxiliary handheld power equipment driving the pinion shaft.

- 3.10 Lifting lugs, and resting legs on the underside of the assembly, will be required for 8" valves and larger.
- 3.11 All valves to be provided with a locking device suitable for the use of standard padlocks.
- 3.12 All valves to be provided with standard block and bleed connections.

4.0 PROCESS OF MANUFACTURE

The valve manufacturer shall manufacture the valves in accordance with a qualified procedure as determined by Section 6.0 Fabrication and Welding Procedure.

5.0 STEEL SPECIFICATION

- 5.1 The material specifications shall be selected by the manufacturer and approved by the Owner and the governing authorities, when applicable.
- 5.2 The chemical composition of the weld ends shall not exceed the following:

a. Carbon	0.25	max.
b. Manganese	1.50	max.
c. Nitrogen	0.012	max.
d. Calcium (Residual)	0.004	max.
e. Niobium (Columbium)	0.04	max.
f. Soluble Aluminium Nitrogen	2:1	min.
g. Aluminium	0.05	max.

Also the Carbon equivalent as determined by the formula:

$$CE = C + \frac{Mn}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Ni + Cu)}{15}$$

shall not exceed 0.42 per cent.

- 5.3 When specified in the purchase order, impact tests will be required on each pressure carrying part or groups of parts when from the same heat of steel.

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6.0 FABRICATION AND WELDING PROCEDURE

6.1 Procedure

The manufacturer shall perform all fabrication and welding, including repair welding, in accordance with established procedures for each valve size and series.

Welding, including repair welding shall be done by submerged arc or manual shielded metal arc welding using low hydrogen procedures. The procedures shall be prepared in written form in the English language and shall include but not be limited to the following:

1. Material
2. Joint Design
3. Welding procedure:
 - a) Type, size and grade of filler metal and flux.
 - b) Speed of welding
 - c) Electrical Characteristics
 - d) Number of weld passes, size depth of fusion and penetration of each weld pass.
4. Dimensions of finished weld.
5. Post weld heat treatment when applicable.

6.2 Procedure Qualification Tests

The manufacturer shall furnish certificates on procedure and welder qualifications for Owner's approval before commencement of production welding. Qualifications shall be to ASME Section IX.

6.3 Record of Procedure Qualification Tests

The manufacturer shall submit to the Owner a procedure qualification report giving the results of all tests and the radiographic film of the weld.

- 6.4 Major weld repairs on valve body castings shall be made only after approval by Owner. A major weld repair is as defined in ASTM A216 Clause 10.3.

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7.0 TESTING PROCEDURES AND TEST REQUIREMENTS

7.1 Testing Procedures

7.1.1 Radiography

Radiography where applicable shall be done in accordance with API 5L Section 9 using ISO penetrameters, and techniques capable of 2.0% minimum sensitivity. Prior to beginning production radiography the manufacturer shall prepare a set of test films which shall be approved by the Owner as the standard for quality, sensitivity and interpretation.

7.1.2 Ultrasonic Testing (Alternative)

As an alternative to Radiography, Ultrasonic Testing in accordance with API 5L Section 9 may be used.

The inspection shall be full volumetric examination of weld metal and heat affected zones. The equipment shall be calibrated at least once per shift or at the request of the Owner.

7.1.3 Pressure Testing

Pressure and time shall be recorded using automatic recording devices. Chart test results shall be clearly identified as to date and type of test, person supervising test, and that no leakage or detrimental permanent deformation occurred.

7.2 Production Test Requirements

7.2.1 The manufacturer shall establish, implement and maintain a quality control system to cover all phases of manufacturing, assembly, final inspection and testing.

7.2.2 The manufacturer shall submit a test report on each valve. This report shall include all test results such as chemical and mechanical tests, certificates of radiographic inspection, certificates of ultrasonic testing, pressure-time charts for air and hydrostatic tests and a complete description of cyclic opening and closing tests.

7.2.3 The manufacturer shall inspect and test all valves in accordance with the following:

7.2.3.1 Furnish chemical and mechanical test reports on all pressure carrying members of each valve.

7.2.3.2 Perform 100% non-destructive testing of weld ends intended for field welding as follows:

1. Castings

- a) Radiography either before or after final machining.
- b) Magnetic particle or dye penetrant inspection after final machining.

2. Pipe

Ultrasonic inspection before or after final machining and magnetic particle or dye penetrant inspection after final machining.

7.2.3.3 Perform 100% radiography of longitudinal welds of weld ends.

7.2.3.4 Perform random 10% non-destructive testing of all other welding using the most applicable method for the particular configuration of the weld cross-section with the consent of Owner.

7.2.3.5 If not specified otherwise in the purchase order, perform hydrostatic testing in accordance with API Standard 6d latest edition. The shell test shall be performed prior to the seat tests. Testing times shall be as follows:

Shell	3 hrs.
Seats	1-1/2 hrs. per side
Seats (air)	1 hr. per side.

The seat testing procedures shall be as follows:

Pressure shall be applied successively on each side of the gate or ball valves while the opposite side and the shell or body are open to the atmosphere.

7.2.3.6 Perform cyclic opening and closing of valve using its own operator for a sufficient period or number of times to assure operation or functioning as intended and for a continuous period of 1/2 hr. for motor-controlled operators as per API Standard 6D.

7.2.4 In addition to the requirements of paragraph 7.2 the first valve manufactured in each diameter and class which shall represent the first lot of 10 valves or less and one valve from each subsequent lot of 10 valves or less shall be tested and inspected in accordance with the requirements given below.

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- 7.2.4.1 Furnish chemical and mechanical test reports on each component part or group of parts when from the same heat of steel, but results shall be shown on all reports covering the heat of steel.
- 7.2.4.2 Perform complete radiography of casting weld ends intended for shop welding.
- 7.2.4.3 There shall be at least 4 radiographs on critical sections of body castings. These sections may be chosen by Owner at his discretion.
- 7.2.4.4 Perform 100% non-destructive testing of all welds joining pressure carrying members using the most appropriate method for the particular configuration of the weld cross-section.
- 7.2.4.5 Perform complete non-destructive testing of seat ring areas, radiography for castings and ultrasonic for fabrications
- 7.2.5 All repair welds shall be 100% non-destructively tested by the same NDE method applied originally to the section.
- 7.2.6 All radiographs shall be identifiable with the particular valve and the respective areas and shall be retained by the manufacturer for the duration of the manufacturer's guarantee period.

8.0 STANDARDS OF ACCEPTABILITY

These standards apply to all inspection and tests specified above.

8.1 Dimensional

8.1.1 Diameter

The internal diameter measured with an internal diameter steel tap at any place within 4 inches from each end shall not vary more than +/- 0.08 inches from the nominal internal diameter.

8.1.2 Bulges, Dents and Flat Areas

All surfaces shall be free of dents, gouges, laminations, arc burns and other detrimental surface defects.

8.1.3 Ovality

The Ovality of the weld ends shall not exceed 1% of the nominal diameter.

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8.2 Non-Destructive Testing

Radiographic and ultrasonic testing of all welds and parent metal shall be done in accordance with Section 7.0 Testing Procedures and Test Requirements. The valve shall not be acceptable if as a result of non-destructive testing any of the following defects are evident:

1. Cracks
2. lack of penetration
3. Laminations
4. Individual gas pockets exceeding 1/16 inch. in any direction and/or concentrations of gas pockets exceeding 4 per 1 sq. inch. Adjacent groups of two or more gas pockets which exceed 0.04 inches in any direction shall be separated by at least 4 inches of sound weld material.
5. Inclusions exceeding 0.08 inches in width or 1/4 inches in length.
6. Undercut exceeding one half the specified nominal wall thickness in length and 10% of the nominal all thickness in depth or 0.04 inches whichever the smaller. Not more than two undercuts are permissible in any 12 inches of weld length.
7. Continual occurrence of undercutting, inclusions, porosity, gas pockets or lack of weld reinforcements regardless of dimensions.
8. Since non-destructive test methods give two dimensional results only, Owner may reject welds which do not appear to meet these standards of acceptability, if there are reasonable grounds to believe the depth of the defect may be detrimental to the strength of the weld.

9.0 OWNER'S INSPECTION

- 9.1 Owner reserves the right to witness any or all of the inspection and testing required of manufacturer.
- 9.2 Owner reserves the right to require additional testing at any time. If defects are confirmed, the cost shall be to the manufacturer's account.
- 9.3 The manufacturer shall afford the Owner all reasonable facilities necessary for determining compliance with this specification.

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10.0 PAINING AND MARKING

The valves will be supplied with manufacturer's standard paint suitable for following conditions:

- Ambient relative Humidity: 10 to 100%
- Maximum Operating Temperature: 50 deg. C.
- Ambient Temperature: 3 to 50 deg. C

All valves will be marked according to MSS-SP-25.

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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
GASKETS

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1.0 SCOPE

This specification covers the following types of gaskets:

Non-metallic type consisting of a flat continuous non-metallic ring.

Combination type consisting of either a metallic core and non-metallic casing or a metallic retainer with non-metallic inserts for use in a High Pressure Gas pipeline and its associated equipment.

2.0 DEFINITION

Refer to the Contract Agreement.

3.0 GENERAL REQUIREMENTS

- 2.1 Type: The gaskets covered by this specification shall be suitable for use with RF Flanges ANSI Class 600.
- 2.2 Size: 50 mm (2 inch) and above

4.0 PRESSURE TEMPERATURE RATING

All gaskets covered by this specification shall be suitable for use with Regasified Liquefied Natural Gas (RLNG) at the maximum operating pressure and temperature.

5.0 GOVERNING SPECIFICATIONS

- 5.1 Gaskets up to and including 609.6mm (24 inch) size shall conform to ANSI B16.5 Annex E latest edition, except as allowed for, in sub-clause 16.6.4 (b).
- 5.2 If a proprietary combination gasket offered does not conform entirely to the standards called for in sub-clause 16.6.4 (a) then the Manufacturer must provide sufficient substantiating evidence with his tender to enable the Owner to satisfy himself of the gaskets suitability for use under all the conditions specified.
- 5.3 Spiral wound gasket as per ASME B 16.20 shall match flanges to ASME B 16.5 upto 24" and for 22" inch and 26" inch and above shall comply with MSS-SP 44
- 5.4 Non metallic gasket as per ASME B 16.21 shall match flanges to ASME B 16.5 upto 24" and for 22" inch and 26" inch and above shall comply with MSS-SP 44

6.0 DIMENSIONS

6.1 Non-metallic and combination type

- Gaskets up to (24 inches) in size excluding (22 inches) shall conform to ANSI B 16.5 Latest edition.
- Gaskets including 22(inches) and (26 inches) and above in size shall conform to MSS-SP44 Latest edition.
- I.D. of Gasket (G) shall be as listed.
- O.D. of Gasket (R) shall be increased to the bolt P.C.D minus one bolt diameter of the flange.

6.2 All gaskets shall be of the thickness and finish suitable for use at the design and service conditions specified.

6.3 All gaskets shall offer a continuous face to their adjacent flanges.

7.0 MATERIALS

7.1 Non-Metallic Gaskets

Shall be made either from Klingerite, or other similar proprietary material recommended by the manufacturer with the consent of the Owner, as suitable for use at the specified design and service conditions.

7.2 Combination gaskets

All metallic components shall be spiral wound 316L.

All non-metallic components must be either creep resistant or suitably restrained by the metallic parts, and free from any age hardening properties which would ultimately impair their sealing properties.

8.0 INSPECTION

Visual inspection only, at the Owner's option, will be required.

9.0 **MARKING**

Each gasket shall be clearly tagged by the Manufacturer with:

- Flange size
- Flange rating

10.0 **PACKING**

Gaskets shall be packed so as to prevent damage during shipment.

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SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
STUD BOLTS & NUTS**

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1.0 **SCOPE**

This specification cover the requirements for stud bolts and nuts connecting carbon and low alloy steel pipe flanges on high pressure pipelines and associated facilities.

2.0 **DEFINITION**

Refer to the Contract Agreement.

3.0 **SIZES**

This specification covers sizes from 12.7 to 89 mm ($1/2$ " to 3-1/2") bolt diameter.

4.0 **TYPE**

Each stud bolt shall be threaded full length and supplied with two hexagonal head nuts and two washers

5.0 **DIMENSIONS**

Dimensions shall be in accordance with ANSI B18.2.

6.0 **MATERIALS**

- Stud bolts shall be alloy steel in accordance with ASTM A-193 Grade B7, Galvanized + PTFE coated.
- Nuts shall be carbon steel to ASTM A-194 Grade 2H, Galvanized + PTFE coated.
- Washers shall be in accordance with ASTM A-307

7.0 **THREADS**

All bolting supplied to this specification shall be threaded in accordance with ANSI B 1.20.1.

Stud bolts shall have Class 2A dimension. Nuts shall have Class 2B dimensions.

8.0 **PACKING**

All stud bolts shall be suitably protected so as to prevent rust and/or mechanical damage during transit.

The method of protection shall be approved by the Owner

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9.0 **INSPECTION**

Unless otherwise indicated in the Purchase Order all material shall be subject to inspection by the Owner or his representative.

10.0 **CERTIFICATION**

The Supplier shall furnish certificates of compliance with the relevant specification and of chemical analyses and mechanical tests carried out.

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SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
HEAT SHRINKABLE FIELD JOINT COATING**

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1.0 GENERAL

1.1 Introduction

This specification defines the minimum technical requirements for the materials and application of:

- heat shrink field joint coatings, applied to weld joints on three-layer polyethylene factory coated pipelines operating onshore or offshore at upto 80°C.
- repair of damaged PE line coating and shrink sleeve

The heat shrink sleeves (HSS), sleeves shall be irradiated cross-linked polyethylene backed have a modified copolymer adhesive. Sleeves shall be applied over a liquid epoxy primer while the epoxy is still in a gel state.

This specification applies to field joints between sections of linepipe previously coated in the factory with a three layer polyethylene coating system and pipe bends and fittings coated with polyethylene.

1.2 Definitions

Refer to the Contract Agreement.

Abbreviations

DSC	Differential Scanning Calorimeter
FBE	Fusion Bonded Epoxy
HSS	Heat Shrink Sleeve
3LPE	Three Layer Polyethylene
PQT	Procedure Qualification Testing
UV	Ultra-Violet
T _{max}	Maximum design temperature

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2.0 CODES AND STANDARDS

The latest edition of the following codes and standards shall establish the minimum standards for the work. CONTRACTOR may use alternate standards that meet or exceed those listed if approved by COMPANY.

International Organisation for Standardisation (ISO)

- ISO 21809-3:2016 Petroleum and Natural Gas Industries – External Coatings for Buried or Submerged Pipelines used in Pipeline Transportation Systems – Part 3: Field Joint Coatings
- ISO 21809-1:2011 External Coatings for buried and submerged pipelines used in pipeline transportation systems – Part 1: Polyolefin coatings (3-layer PE and 3-layer PP)
- ISO 2808 Paints and Varnishes – Determination of Film Thickness
- ISO 8501-1 Preparation of Steel Substrates before Application of Paints and Related Products-Visual Assessment of Surface Cleanliness. Part 1- Rust grades and preparation grades of uncoated steel substrates and of steel substrates after removal of previous coatings
- ISO 8503-1 Preparation of Steel Substrates before Application of Paints and Related Products-Surface roughness characteristics of blast cleaned steel substrates. Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast cleaned surfaces
- ISO 9001 Quality Management System – Requirements
- ISO / IEC 17025 General requirements for the competence of testing and calibration laboratories

European Standard

- EN 10204 Metallic Products - Types of inspection documents
- EN 12068 Cathodic Protection – External Organic Coatings for the Corrosion Protection of Buried or Immersed Steel Pipelines Used in Conjunction with Cathodic Protection – Tapes and Shrinkable Materials

Det Norske Veritas (DNV)

- DNV RP F102 Pipeline Field Joint Coating and Field Repair of Linepipe

(May 2011) Coating

National Association of Corrosion Engineers (NACE)

NACE RP0274 High-Voltage Electrical Inspection of Pipeline Coatings

Steel Structures Painting Council

SSPC SP1 Surface Preparation Specification No. 1, Solvent Cleaning

American Society for Testing and Materials (ASTM)

ASTM D149 Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

ASTM D257 Standard Test Methods for DC Resistance or Conductance of Insulating Materials

ASTM D570 Standard test method for water absorption of plastics

ASTM D638 Standard Test Method for Tensile Properties of Plastics

ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D870 Standard Practice for Testing Water Resistance of Coatings Using Water Immersion

ASTM D1000 Standard Test Method for Pressure Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

ASTM D1002 Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)

ASTM D1238 Standard Test method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

ASTM D1505 Standard Test Method for Density of Plastics by the Density Technique

ASTM D1525 Standard Test Method for Vicat Softening Temperature of Plastics

ASTM D1693 Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics

- ASTM D2240 Standard Test Method for Rubber Property-Durometer Hardness
- ASTM D3012 Standard Test Method for Thermal Oxidative Stability of Polyethylene Using a Specimen Rotator Within an Oven
- ASTM D3418 Standard Test Method for Transition Temperatures of Polymers by Differential Scanning Calorimetry
- ASTM D3417 Standard Test Method for Enthalpies of Fusion and Crystallisation of Polymers by Differential Scanning Calorimetry (DSC)
- ASTM D3895-04 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
- ASTM D4703 Standard Practice for Compression Moulding Thermoplastic Materials into Test Specimens, Plaques or Sheets
- ASTM E28 Standard Test Methods for Softening Point of Resins Derived From Naval Stores by Ring and Ball Apparatus
- ASTM F372 Standard Test Method for Water Vapour Transmission Rate of Flexible Barrier Materials Using an Infrared Detection Technique
- ASTM G14 Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)
- ASTM G42 Standard Test Method for Cathodic Disbonding of Pipeline Coatings Subjected to Elevated Temperatures
- ASTM G95 Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (23deg.Cached Cell Method)

Deutsches Institut für Normung (DIN)

- DIN 30670 Polyethylene Coatings for Steel Pipes

3.0 DOCUMENT PRECEDENCE

The CONTRACTOR shall notify COMPANY of any conflict between this specification, the related data sheets, the Codes and Standards and any other specifications noted herein. Resolution and/or interpretation precedence shall be obtained from COMPANY in writing before proceeding with the design or manufacture.

In case of conflict, between this specification and other documents the order of precedence shall be:

- National and/or Local Regulations
- Equipment Data Sheets (if any)
- Equipment Narrative Specification
- Project Specifications
- Design General Specifications, Standards
- Industry Codes and Standards

4.0 SPECIFICATION DEVIATION/CONCESSION CONTROL

Any technical deviations to the Specifications attachments including, but not limited to, the Data Sheets and Narrative Specifications shall be obtained by the CONTRACTOR only through CONCESSION REQUEST format. CONCESSION REQUESTS require COMPANY's review/approval prior to implementation of the proposed changes. Technical changes implemented prior to COMPANY approval are subject to rejection.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Management Systems shall comply with all the requirements of ISO 9001:2000. The CONTRACTOR shall ensure that the VENDOR shall have in effect, at all times, a QA programme which clearly establishes the authorities and responsibilities of those responsible for the Quality System. Persons performing Quality functions shall have sufficient and well-defined authority to enforce Quality requirements that they initiate or identify and to recommend and provide solutions for Quality problems and thereafter verify the effectiveness of the corrective action.

Quality System and Quality Control requirements shall be identified and included in the CONTRACTOR's Purchase Documentation. Based on these requirements the VENDOR will develop a QA/QC programme which shall be submitted to the CONTRACTOR for review and approval with the consent of the Owner. The Vendor's QA/QC programme shall extend to SUB-CONTRACTORS and SUB-SUPPLIERS. On request, the VENDOR shall provide objective evidence of QA/QC surveillance for all levels of the VENDOR activity.

COMPANY reserves the right to inspect materials and workmanship at all stages of manufacture and to witness any or all tests. The VENDOR, 30 days after award but prior to the pre-inspection meeting, shall provide the COMPANY with a copy of its manufacturing Inspection and Test Plan and with copies of all related/ referenced procedures for review and approval. The inspection and Test Plan will also be reviewed for inclusion of any mandatory COMPANY witness or hold points.

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The laboratory, which conducts chemical analysis and the various mechanical tests required by this specification, shall have ISO 9000 accreditation and preferably and industry-specific accreditation for test houses such as NAMAS/UKAS or equivalent.

6.0 DESIGN CONSIDERATIONS

The following climatic conditions shall govern the design of the equipment:

Temperature:	a)	Air	
		Maximum summer dry bulb	: 58°C
		Maximum solar temperature (black body)	: 85°C
		Minimum winter dry bulb	: 5°C
	c)	For design and testing of coating	
		T _{max}	: 80°C

Relative Humidity:

Maximum (at 54°C)	: 60 percent
Maximum (at 43°C)	: 95 percent
Design	: 100 percent

7.0 MATERIALS AND APPLICATION PROCEDURES

- 7.1 CONTRACTOR shall provide all necessary hand tools, consumables, surface preparation and coating equipment, propane torches, liquid epoxy primer application kit, coating materials, power supplies (electrical, air, etc.), storage containers, fuel and other items required to coat the line pipe field joints and perform field repairs of factory coatings in accordance with this specification.
- 7.2 Prior to commencing the coating prequalification trials (PQT), the CONTRACTOR shall submit a detailed written description of the coating equipment, procedure and materials for COMPANY'S review. The description shall be accompanied by full details and results of tests on similar coating, or trials performed by CONTRACTOR, which document the quality of the finished coating. Such test results and/or trials shall demonstrate, to the satisfaction of COMPANY, that CONTRACTOR equipment, procedures and materials can supply a finished coating meeting the requirements of this Specification.
- 7.3 The description of the coating application procedure shall include:
- Coating PQT procedures
 - Training and certification of operators whom shall apply the coating

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- Preparation of factory coating cutbacks
- Surface preparation of field joints (including cleaning and abrasive blasting)
- Inspection of field joints after surface preparation
- Liquid epoxy application method
- Heat shrink sleeve application method
- Field repair procedures for factory applied coatings
- Testing and inspection
- Quality control
- Quality assurance

The equipment description shall cover all handling, cleaning, coating, testing and inspection equipment to be used.

Details of all materials to be used for pipe coating shall be provided.

- 7.4 CONTRACTOR shall confirm by his experience and historical test data, demonstrating to the satisfaction of COMPANY, that the applied thickness of the coating system will meet the requirements of this specification.

8.0 HANDLING AND STORAGE OF COATING MATERIALS

8.1 General

- 8.1.1 Materials shall be handled and stored in accordance with applicable safety regulations and the material manufacturer's recommendations, and shall be used according to the manufacturer's batch sequence.
- 8.1.2 The CONTRACTOR shall submit details of material control recording procedure to COMPANY for review prior to commencement of the works.
- 8.1.3 The CONTRACTOR shall submit details of his traceability procedure for COMPANY's review and approval. In order to ensure coating application traceability the CONTRACTOR shall record the batches of material used to coat each individual field joints and the time and date of coating, the information shall be presented to the Company on completion of the contract.

- 8.1.4 The containers or packages of materials shall be properly handled in order to avoid damage. Coating materials shall be segregated by type and batch during storage and handling.
- 8.1.5 Storage temperatures for coating materials shall be as specified by the manufacturer.

9.0 COATING MATERIALS

- 9.1 The joint coating system shall consist of:
 - A high build 100% solids liquid novolac epoxy applied to the bare steel to a minimum DFT of 300 microns
 - A dual layer heat shrink sleeve with an inner layer of a high shear strength copolymer adhesive and an outer layer of radiation crosslinked polyethylene backing having the following thickness:
 - HDPE backing: >1.0mm as-supplied
 - Adhesive: >1.5mm as-supplied
- 9.2 The PE shrink sleeve system shall as a minimum meet the requirements of ISO 21809-3:2016 standard Table 17, Type 14B-2 and the requirements listed in APPENDIX 1 of this specifications.
- 9.3 The backing of the shrink sleeve shall be made of high density PE with a density $\geq 0.95\text{gm/cc}$ and a Shore D hardness ≥ 55 . This is critical to minimize the permeation of moisture and oxygen through the sleeve, and hence under coating corrosion, over the service life of the pipeline.
- 9.4 Resistance to High Black Body Temperature and UV:

To ensure that the sleeve is applicable high ambient temperature and Black Body temperatures and high UV, the backing and adhesive shall be such that it shall be fully installable without damage. It shall meet the requirements of EN12068 C80 UV. It shall not be necessary, nor will it be allowed, to paint or cover the installed shrink sleeve with any protective cover during the peak of the summer. Under the direct sun in the summer and without any protective coating, the sleeve and adhesive shall not become soft and the adhesive shall not flow. Any sleeve which exhibits such softness or flow of adhesive when directly exposed to the sun shall be considered unsuitable and rejected.
- 9.5 The Manufacturer's trade name and data sheet for each proposed coating material shall be submitted by CONTRACTOR for COMPANY's approval prior to placing any order for coating materials.
- 9.6 Individual data sheets of all raw materials from Manufacturer(s) for each batch shall be kept and one copy shall be stored in the Work data book.

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9.7 CONTRACTOR shall submit third party independent laboratory testing data to prove compliance with ISO 21809-03:2016 and EN12068 C80 UV. Acceptable Test labs shall have valid IEC 17025 (General requirements for the competence of testing and calibration laboratories) accreditation and may be one of the following if their certification is valid:

- a) DVGW, Germany
- b) Element (previously known as EXOVA/Bodycote), US, EU,UK, Abu Dhabi
- c) TUV Nord, Europe
- d) Intertek, UK / USA

9.8 CONTRACTOR shall demonstrate a track record of previous supply and have been approved for use by other major Oil and Gas operating companies. The Shrink sleeves Materials to be supplied shall have a track record of satisfactory performance for a period of at least ten years worldwide on projects of equal or larger size. Shrink sleeves shall have been used by at least five international companies and projects outside the country of the shrink sleeve manufacturer.

9.9 The coating materials shall comply in all details with this specification and shall be suitable for the specified coating application procedure, the principle stages of which are as follows:

- Surface preparation by abrasive blasting;
- Application of liquid applied epoxy;
- Application of heat shrink sleeve.

The packaging of all coating materials by the CONTRACTOR shall be clearly marked with the following details:

- Name of manufacturer;
- Material identification;
- Batch number;
- Place and date of manufacture;
- Manufacturing standard (if appropriate);
- Shelf life/expiry date (if appropriate);
- Quantity;

- Health and Safety and Environmental Instructions (Material Safety Data Sheets);
- Storage Instructions (storage shall normally be at a temperature not greater than 25°C).

Any material not labeled with the above information shall not be used.

9.10 The MANUFACTURER's trade name and data sheets for all coating materials, including cleaning and abrasive blasting consumables, which are proposed to be used by the CONTRACTOR, shall be submitted for COMPANY's approval prior to the placing of any order for coating work.

9.11 Liquid Epoxy

The first layer of the joint coating system shall be a two component 100% solids novolac epoxy suitable for hand application and be suitable for use at the design temperature of the pipeline. It shall be compatible with the polyethylene shrink sleeve adhesive.

The CONTRACTOR shall provide this information for COMPANY's approval prior to the start of coating operations.

9.12 Heat Shrink Sleeves

9.12.1 The heat shrink sleeve material shall be subject to approval by COMPANY and shall be suitable for buried or offshore service in the environment the pipeline is to be laid upto a maximum design temperature of 80°C. Any long term exposure limitations shall be clearly defined by Contractor.

9.12.2 The heat shrink sleeve shall be type HTI.P80 consisting of a radiation cross-linked and stretched polyethylene backing and compatible polyethylene adhesive. The sleeve may be formed into a tube or pre-cut wrap around sleeve with closure system.

9.12.3 The backing shall consist of a radiation cross-linked and stretched polyethylene backing which is designed to partially or fully recover with heat from a torch during application. The backing shall also provide resistance against mechanical damage during construction and in service. As one of the requirements for Quality Control of proper shrinking of sleeve, the shrink sleeve backing shall have a built-in permanent change indicator. This shall be in the form of a dimpled pattern on the backing. Prior to shrinking (sleeve as supplied), the dimple pattern shall be clearly visible and feelable to the touch. Once the sleeve has been shrunk down

properly, the dimple pattern shall disappear and the sleeve surface shall become completely smooth.

- 9.12.4 The sleeve shall be of sufficient width to cover the full joint plus at least 50mm of polyethylene coating beyond the cutback on either side of the joint, after application. The minimum thickness of the installed sleeve at any point of the pipe body shall be 2.5mm. A sleeve, which does not meet the above thickness requirement shall be rejected, stripped and replaced.

MAINLINE COATING CUTBACK	SLEEVE WIDTH AS SUPPLIED
Max 150mm	450mm
Max 170mm	500mm

- 9.12.5 The shrink sleeve system shall as a minimum meet the requirements listed in APPENDIX I.

10.0 SURFACE PREPARATION

- 10.1 All dirt, grease or other contamination shall be removed from the pipe, the exposed FBE and the first 100 mm of the factory applied polyethylene on either side of the field joint, prior to blast cleaning. This cleaning operation shall use solvents which do not leave a residue. Alkaline or emulsion cleaners shall not be used. Solvent cleaning shall be conducted in accordance with SSPC-SP1.
- 10.2 Chloride contamination shall be checked prior to blast cleaning. A salt test meter, such as an Elcometer Salt Contamination Meter, shall be used to check for chloride contamination. The meter shall be calibrated and used in accordance with the manufacturer's recommendation. The chloride content on the metal surface shall be measured and recorded at three locations and shall not exceed 4µg/cm².
- 10.3 Weld splatter, weld slag, sharp edges, burrs, etc., and any other surface discontinuities shall be removed prior to abrasive blasting.
- 10.4 The first 100 mm of polyethylene line pipe coating either side of the field joint shall be roughened with a grinder using a disk with a grit rating of 40 to 60, or MANUFACTURER approved equivalent method, to expose the fresh polyethylene coating and to provide a roughened surface to facilitate adhesion of the sleeve adhesive to this area during sleeve application.

The edge of the polyethylene factory coating on either side of the field joint shall be chamfered to a transition angle of within 15 - 30 degrees to the pipe axis.

- 10.5 Expendable blasting system shall be used and the abrasive shall be industrial grade Garnet or copper slag or COMPANY approved equivalent. Sand is not permitted for blast cleaning due to its HSE hazard (causes Silicosis) and the risk of imbedding pulverized fine particles in the anchor pattern which effect the long term adhesion of the shrink sleeve.
- 10.6 The exposed steel surface shall be abrasive blast cleaned to a near white metal finish (SA 2 1/2) in accordance with ISO 8501-1. The surface profile shall be 50 to 100 microns (ISO 8503-1). or as recommended by the sleeve manufacturer.

During production, the surface profile shall be initially checked on every joint using Testex tape or a calibrated electronic profile gauge. Subsequently as the repeatability of the blasting results is established, profile testing may be reduced to 1 in every 50 joints.
- 10.7 No blast cleaning shall take place when the prevailing relative humidity is greater than 85 percent unless pipe is preheated to at least 3°C above the dew point. During periods of inclement weather, (rain, wind etc.) cleaning and coating operations shall not take place.
- 10.8 Following abrasive blasting the surface shall not be contaminated with dirt, dust, metal particles, hydrocarbons, water, chlorides, sulphates or any other foreign material which would be detrimental to the coating. Any dust or loose residue that has accumulated during blasting and/or grinding operations shall be removed by the use of clean compressed air.
- 10.9 Chlorides check shall be performed after blast-cleaning and removal of dust or loose residues by vacuuming or other COMPANY approved methods. Any level in excess of 4 µg/cm² shall result in washing the joint area with potable water and drying until level falls below this value. All water used for rinsing or cleaning purposes shall be with less than 200ppm total dissolved solids and 30 ppm chlorides.
- 10.10 The total elapsed time between the start of blasting of any pipe bend or fitting and the heating of that pipe to the specified temperature shall not exceed the following time - humidity APPENDIX:

<u>Percent Relative Humidity</u>	<u>Elapsed Time Hours</u>
85	0.5
80	1.0
70	1.5

<u>Percent Relative Humidity</u>	<u>Elapsed Time Hours</u>
60	1.75
50	2.0

Any pipe surface not processed within the above time-humidity APPENDIX shall be completely re cleaned and re-blasted before coating.

- 10.11 The field joint area and application equipment shall be shielded from contamination by air born debris during field joint preparation and coating operations.

10.0 PREHEATING

- 11.1 Pre - Heating of joint area prior to application of epoxy shall be done using safe and appropriate method acceptable to the Company.
- 11.2 The temperature of the bare steel surface and the epoxy coated steel shall be monitored using a pyrometer. Touch temperature probes shall be used periodically to ensure that the temperature requirement is being met. Care shall be taken to ensure that the entire circumference of the pipe, including the shady side and bottom, are heated evenly.
- 11.3 In order to avoid damage to the 3LPE main line coating, the preheat temperature shall not exceed 85°C.

12.0 COATING APPLICATION

12.1 General

- 12.1.1 CONTRACTOR shall have his Applicators trained and certified by the Shrink sleeve manufacturer. Only such certified Applicators shall be allowed to install heat shrink sleeves. Applicators not trained and certified by the Shrink sleeve manufacturer shall not be allowed to install shrink sleeves.
- 12.1.2 After supply of materials and prior to commencing joint coating, the CONTRACTOR shall perform Coating Procedure Qualification Testing (PQT) tests to verify the performance of the heat shrink sleeves as per APPENDIX 2.
- 12.1.3 Application of the heat shrink sleeves shall be in accordance with the

material manufacturers recommendations and the procedures outlined below.

- 12.1.4 Adequate shielding of the field joint area shall be made during the joint coating operations, so as to prevent air cooling of the surface due to environmentally windy conditions.
- 12.1.5 The pipeline shall be fully supported either side of the joint area to allow the sleeve to be fitted. The supports shall be rigid and padded to prevent damage to the surrounding parent coating material.

12.2 Liquid Epoxy Application

- 12.2.1 Immediately following blast cleaning of the joint area, the field joint shall be uniformly heated, using safe and appropriate method acceptable to the Company, to the temperature recommended by the manufacturer. The temperature of the joint shall be checked and recorded at a minimum of four locations around the joint using a pyrometer. The pyrometer shall be checked for error on a daily basis against a temperature-measuring instrument. Tempil sticks shall not be used.
- 12.2.2 The two components of the liquid epoxy shall be thoroughly mixed and applied to the heated field joint surface using a small brush or suitable applicator, to give a wet film thickness suitable to achieve a dry film thickness of minimum 300 microns. The wet film thickness required shall be determined during PQT and shall be checked during application using a comb gauge. The epoxy shall be visually checked for integrity prior to the application of the wrap around sleeve. The liquid epoxy shall be applied to the bare steel area only.

12.3 Heat Shrink Sleeve

- 12.3.1 Sleeves shall be clean, free from dust and dirt, moisture and chemical contamination up to and during the time of application.
- 12.3.2 Immediately after the epoxy has been applied, and while it is still in the wet / gel condition, the shrink sleeve shall be centered over the weld area and wrapped around the field joint overlapping onto itself. Epoxy shall not be allowed to cure prior to the shrink sleeve installation to ensure a chemical bond between the epoxy and the sleeve adhesive. If epoxy cures prior to shrink sleeve application, the joint shall be blast cleaned and the whole process of joint coating started all over again.
- 12.3.3 The closure shall be centered over the longitudinal seam of the shrink sleeve overlap. It shall be heated using a propane torch with the flame

adjusted according to the manufacture's instructions. Any wrinkles or entrapped air in the closure shall then be smoothed out using a gloved hand and or rollers.

12.3.4 Propane torches as per Manufacturer's recommendation shall be used to heat the HSS circumferentially around the joint heating from the centre of the joint outwards, towards one end of the joint only, and then from the centre towards the other end of the joint. When fully shrunk, adhesive flow shall be visible at both edges of the sleeve. The Permanent Change Indicator (embossed pattern) shall have disappeared and the surface shall be smooth. The backing shall be pulled/lifted back with a gloved finger at the sleeve edges around the circumference. The adhesive should remain liquid and in contact with the underlying 3LPE factory coating. If the adhesive lifts with the backing, additional heat shall be applied to sleeve until it passes this test.

12.3.5 Once sleeve is fully recovered on the pipe, sleeve application shall be completed by postheating with long horizontal strokes using propane torches over the entire sleeve surface to ensure a uniform bond.

12.3.6 All other operations shall be in accordance with the Manufacturer's recommendations.

13.0 INSPECTION, TESTING, AND INSTALLER TRAINING AND CERTIFICATION

13.1 General

In order to demonstrate that the CONTRACTOR'S proposed coating application procedure and materials is capable of meeting the specification, the CONTRACTOR shall be required to undertake Coating Procedure Qualification Testing (PQT) prior to commencing production. The CONTRACTOR shall also be required to test the finished coating during production to demonstrate continued compliance with this specification. Details of all inspections and testing shall be fully documented in accordance with Section 13.0.

13.2 Coating Procedure Qualification Testing (PQT)

13.2.1 Six pipe lengths of the largest pipe diameter and the smallest pipe diameter of the project shall be set aside for coating PQT. These six pipe lengths shall be welded up in pairs to provide three field joints which shall then be coated in accordance with the requirements of this specification and shall be witnessed by COMPANY'S representative.

13.2.2 The sample coated field joints shall be subjected to a complete set of tests as specified in APPENDIX-2. The sample shall pass all the criteria contained in APPENDIX-2 before production commences. For the destructive tests appropriate size test pieces shall be cold cut from the coated field joint.

13.2.3 As applicable, the test methods for all tests required for PQT on the complete coating system shall be performed in the same manner as the production tests.

13.2.4 Additionally during the coating PQT the CONTRACTOR shall demonstrate and qualify his proposed repair procedures for the factory applied coating.

13.2.5 The CONTRACTOR shall provide a written procedure that complies with all tests carried out during PQT. These procedures shall be used during production testing. A PQT report shall be issued, before production coating commences, describing the field joint application procedure and including results of all tests carried out on coating materials, and the finished coating and all measurements recorded during joint preparation and coating application.

13.3 **Production Testing**

Production testing shall be performed on field joints in accordance with the schedule in APPENDIX-3. Other tests may be requested by COMPANY after a change in normal operations or as a result of material change or quality acceptance failure. Tests shall be carried out as per ISO21809-3:2016 test procedures.

13.4 **Installer Training and Certification**

Prior to the start of construction, manufacturer /his authorized representative shall train Contractor installers in the proper installation of the heat shrink sleeves. On successful completion of the training, manufacturer of the shrink sleeves shall issue Certificates to the trained installers valid for a period of 2 years. Only such certified installers shall be allowed to install heat shrink sleeves.

14.0 **DOCUMENTATION**

All stages of preparation, coating and testing shall be subjected to continuous inspection by the CONTRACTOR, who shall record and report the results of the inspections and tests in a form to be agreed with COMPANY prior to commencement of the prequalification trial (PQT).

On completion of the contract the CONTRACTOR shall submit to COMPANY the following documentation.

- ♦ Traceability records relating to coating material batch numbers and field joint numbers;
- ♦ Repair records;
- ♦ Manufacturer's Certificates for each batch of coating materials;
- ♦ Certification/Calibration Certificates for all testing and coating equipment;
- ♦ Inspection and Test, Records, Results, and other Documentation of all Material and Coating tests.

All reports shall be signed by the CONTRACTOR to signify compliance with the requirements of this specification.

15.0 **HEALTH AND SAFETY**

The application of tar based products may pose a risk to health. The CONTRACTOR shall strictly observe the health and safety data sheets issued by the Manufacturer of the products.

APPENDIX I

PERFORMANCE REQUIREMENTS – HEAT SHRINK SLEEVES

PERFORMANCE PARAMETER	Test Method	Required Result
EPOXY		
Dry Film Thickness on steel		≥300microns
Pull off adhesion strength to steel at 23°C	ASTM D4541	≥15 MPa
SHRINK SLEEVE BACKING		
Density	ASTM D792	≥0.95 gm/cc
Hardness of backing	ASTM D2240	≥55 Shore D
Tensile strength	NACE RP0303 (ASTM D638)	≥ 15MPa
Elongation to break	NACE RP0303 (ASTM D638)	≥ 400%
SHRINK SLEEVE ADHESIVE		
Ring and Ball Softening Point of adhesive	ASTM E-28	≥ 110 °C
Lap Shear Strength of adhesive	ASTM D1002	≥3.5 MPa (500psi) at 23°C ≥0.35 MPa (50psi) at 80°C
SHRINK SLEEVE AS-SUPPLIED		
Sleeve thickness - Backing Adhesive Total		≥1.0mm ≥1.5mm ≥2.5mm
INSTALLED SHRINK SLEEVE		
Conformance to ISO21809-3:2016		Independent Lab Test report confirming compliance
Holiday detection at 5kV/mm + 5kV	ISO 21809-3	No holiday
Impact Resistance at 23°C	ISO 21809-3	Pass 7J/area Impact
Indentation Resistance @80°C	ISO 21809-3	Residual thickness >0.6mm and no Holiday at 15kV
Cathodic Disbondment at 80°C after 28days	ISO 21809-3	≤ 10mm
Peel Strength to steel and adjacent PU line coating	ISO 21809-3	≥5 N/mm at 23°C ≥0.3 N/cm at 80°C
Peel Strength to steel and adjacent PE line coating after 100 days hot water soak at 80°C	ISO 21809-3	P ₁₀₀ /P ₀ ≥0.75 at 23°C
Lap shear strength	ISO 21809-3	≥3.0 N/mm at 23°C ≥0.20 N/mm at 80°C
Thermal Ageing, 100 days at 100°C - Elongation at break - Peel strength to pipe surface	ISO 21809-3	E ₁₀₀ /E ₁₀ ≥ 0.75 P ₁₀₀ /P ₁₀ ≥ 0.75
Ultraviolet resistance	EN12068 Class C80 UV	Independent Lab Test report confirming compliance
Dielectric Breakdown at 23°C	ASTM D-149	≥ 30 kV
Soil stress creep resistance, 24hrs at 80°C	TP-206	Creep ≤ 0.1 mm
Holiday Detection	ISO 21809-3	No holidays at 20 kV

APPENDIX 2

**PROCEDURE QUALIFICATION TEST (PQT)
FOR HEAT SHRINK SLEEVE FIELD JOINT COATING**

Property	Acceptable Value	Test Method	Frequency of Tests
BEFORE INSTALLATION OF SHRINK SLEEVE			
After Abrasive Blasting • Cleanliness • Profile • Chlorides	Sa 2½ 50 – 100 µm 5 µg/cm²	ISO 8503-1	Each Joint
Hardness of backing	≥55 Shore D	ASTM D2240	One sleeve
Pull off adhesion strength to steel at 23°C (>300 microns DFT applied to a blast cleaned flat steel plate)	≥15 MPa	ASTM D4541	One plate
AFTER INSTALLATION OF SHRINK SLEEVE			
Visual Inspection	Smooth, blemish free, with no dust, grit, or other particulate inclusions. A blemish that has no detrimental effect shall be acceptable if it meets the other criteria of being smooth, bonded and has no inclusions.	Visual	Each Joint
Thickness Check	≥2.5mm on body		Four Readings at each 9, 12, 3 and 6 o'clock Position per Joint
Holidays	No Holidays at 17.5kV	ISO 21809-3	Each Joint
Impact Resistance	15 J at 23°C No Breakdown	ISO 21809-3	1 Joint
Adhesion to Steel, and 3LPE	Refusal To Peel or a Cohesive Failure or backing stretch / break with following values achieved: ≥ 5 N/mm at 23°C, ≥ 0.3 N/mm at 80°C	ISO 21809-3	Each joint: 1 test on body of pipe and 1 test over PE line coating at 23°C and at 80°C, for each joint
Cathodic Disbondment at 80°C after 28days	≤ 15mm	ISO 21809-3	1 Joint: 1 test over body of pipe
Indentation Resistance	≥ 0.6 mm residual thickness after 24 hours at 80°C	ISO 21809-3	1 Joint

APPENDIX 3

PRODUCTION INSPECTION / TESTING OF HEAT SHRINK SLEEVE FIELD JOINT COATING

Property	Acceptable Values	Test Method	Frequency of Tests
Materials Check	Check Certificates and Labeling		Every Batch
Environmental Conditions	Temperature, humidity and weather conditions		Prior to start up of work and if Interruption in work, Start of Shift, End of Shift
Cleanliness	No Contamination		Every Joint
After Abrasive Blasting • Cleanliness • Profile • Chlorides	No 2 $\frac{1}{2}$ 30-100 μ m 2 μ g/cm 2	ISO 8503-1	Once in a day's production
Pre-Heat	As per manufacturer's recommendation		Every Joint before Epoxy Application
Visual Inspection	Smooth, blemish free, with no dust, grit, or other particulate inclusions.		Every Joint
Thickness Check	≥ 2.5 mm over body		Four Readings at each 9, 12, 3 and 6 o'clock Position checked on 1 out of every 5 joints
Holidays	No Holidays at 20kV	ISO 21809-3	100% Every Joint
Adhesion to Steel, and JLPE	Refusal To Peel or a Cohesive Failure or backing stretch/break at following values: > 5 N/mm at 23 $^{\circ}$ C	ISO 21809-3	One joint per days production or 50 joints whichever is lower.

APPENDIX 4

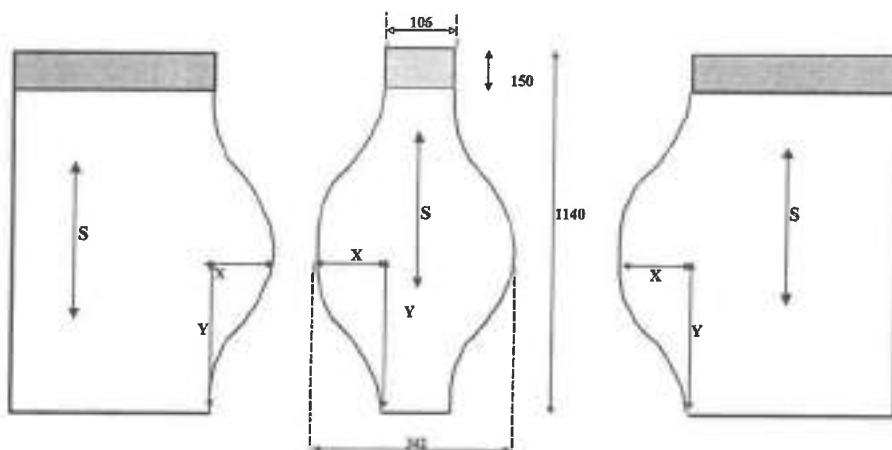
INSTALLATION OF SHRINK SLEEVE ON BENDS

Bare bends / elbows shall be coated by installing multiple adjacent overlapping sleeves along the bend / elbow in a "Inbster" style.

The method of installation of the shrink sleeves shall be identical to the sleeve as installed over a weld joint, in terms of steel preheat, epoxy application and shrinking.

- Starting from one end and leaving 4"-5" for welding, preheat the steel area to be covered by the shrink sleeve to the same temperature as for the sleeve that is installed on the weld joint
- Apply mixed epoxy to the steel area to be covered.
- Install the first shrink sleeve in a manner identical to installing the sleeve over the weld joint.
- Install a second sleeve adjacent to the first sleeve, overlapping onto the first sleeve by 3" minimum after installation. Ensure that the closure patches of adjacent sleeves are offset from each other by at least 3" so that they are not all in line with each other.
- Continue installing additional adjacent sleeves until the entire bend is coated

If bend radius is $>3D$, install the sleeves without any special cutting. In the case of small radius bends ($\leq 3D$) cut the sleeve to a profile as shown below with dimensions to be recommended by the sleeve supplier. Do so before installing the sleeve.



APPENDIX 5**REPAIR OF DAMAGED 3LPE LINE COATING AND SHRINK SLEEVE**

Damaged PE line coating or Heat Shrink Sleeves shall be repaired as per the following criteria:

1. Small Damages Extending up to 1.0 cm²

Small damages to 3LPE or sleeve should be repaired using PE melt sticks (Covalence PE-MELTSTICK).

2. Damages Extending up to 300 mm or 100 cm²

Polyethylene repair patches precoated with hotmelt adhesive (Covalence PERP80), should be used in conjunction with a filler adhesive (S1137) and epoxy primer (if bare steel visible). Repair patches when installed should overlap the damaged area by minimum 50 mm all round.

3. Damages Extending Over 300mm or 100cm²

Full encirclement heatshrink sleeves with epoxy primer should be used.

The PE Melt Stick shall, as a minimum meet the following requirements:

PERFORMANCE PARAMETER	Test Method	Required Value
Dielectric Strength (23 ⁰ C)	IEC 243	>10Kv/mm
Tensile Strength (23 ⁰ C)	ISO R-527	>5MPa
Hardness (23 ⁰ C)	ISO R-868	>30 shore D
Impact Strength (23 ⁰ C)	EN12068 ClassC	15 Joules, pass
Holiday Detection (23 ⁰ C)	DEN 30672	Pass 5Kv+5Kv/mm

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The PE repair patch shall as a minimum meet the following requirements

PERFORMANCE PARAMETER	Test Method	Required Value
Conformance and certification to EN12068 C80 standard	EN12068 C80	Pass
Adhesive Softening Point	ASTM E-28	>110°C
Adhesive Water Absorption (23°C)	ASTM D-570	<0.3%
Adhesive Peel Strength to PE coating (23°C)	EN12068	>0.4N/mm
Adhesive Shear Strength (23°C)	EN12068	>0.05N/mm ²
Tensile Strength of Backing (23°C)	ASTM D-638	>15 MPa
Ultimate Elongation of Backing (23°C)	ASTM D-638	>400%
Dielectric strength of backing (23°C)	ASTM D-149	>12 kV/mm

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 Zishan Engineers (Pvt.) Ltd. An ISO 9001-2015 certified company, 47/F, Block 5, PECIES, Karachi-Pakistan Tel: (92-21) 34393045-48 & 34330151-54 Fax: (92-21) 34334330 & 34310196 E-mail: contact@zishanengineers.com, Web: www.zishanengineers.com	Document No.	255-R-SPM-013
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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
FACTORY MADE LARGE RADIUS PIPE BENDS

ISSUED FOR REVIEW

A	03-05-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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ZISHAN ENGINEERS (PVT.) LTD.

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1.0 SCOPE

This specification covers the minimum requirement for manufacture and supply of factory made large radius pipe bends.

2.0 DEFINITION

Refer to the Contract Agreement.

3.0 MATERIALS

The large radius pipe bends (5D Bends) are to be made from LSAW pipe, API 5L X-65 for 14"ND line Pipe and are to be made from LSAW pipe.

4.0 MANUFACTURING PROCESS

The pipe bends will be made by High Frequency Induction heating method.

5.0 MANUFACTURING TOLERANCES

The Ovality and wall thinning rates of the pipe bends will be within the following limits:

- Ovality : 2% Max.
- Wall thinning rate : 5% Max.

6.0 TECHNICAL DOCUMENTS

The Vendor shall submit three sets of following inspection and test certificates along with the supply.

- Hydrostatic tests
- Chemical analysis
- Mechanical properties (yield strength, ultimate tensile strength and elongation).
- Dimensional checks.

Vendor shall indicate the make/origin of pipe used for large radius bends in their quotation.

24.



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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
COATING OF LARGE RADIUS FACTORY BENDS (FBE)**

ISSUED FOR REVIEW

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1.0 **GENERAL**

1.1 **Scope**

1.1.1 This specification covers the supply and application of 0.4 mm Fusion Bonded Epoxy (FBE) Corrosion Protection Coating on Large radius factory made pipe bends.

The work includes the furnishing of all labor, materials, tools and equipment and the performance of all operations and incidentals necessary for the coating, handling, storing and shipping of coated line pipe.

1.2 **Definitions**

Refer to the Contract Agreement.

1.3 **Environmental Data**

The site environmental conditions are as follows:

Ambient Temperature

- Maximum 50 °C
- Minimum 5 °C

Humidity

- Maximum 85%
- Minimum 20%

Average annual rainfall 200 mm

Soil Temperature 30 °C

1.4 **Errors or Omissions**

1.4.1 The review and comment by the COMPANY of any drawings, procedures or documents referred to in this Specification shall only indicate acceptance of general requirements and shall not relieve the VENDOR of its obligations to comply with the requirements of the contract.

1.4.2 Any errors or omissions noted by the VENDOR in this Specification shall be immediately brought to the attention of the COMPANY.

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1.5 Deviations

All deviations to this Specification and other specifications be made in writing and shall require the written approval of the COMPANY.

2.0 CODES, STANDARDS AND SPECIFICATIONS

All materials and equipment supplied and work performed under this Specification shall conform to the latest edition of the industry standards, codes, references and recommended practices listed below:

ASME B31.8	Gas Transmission and Distribution Piping Systems
ISO 9000/9001/9002	Quality Systems
API Spec 5L	Specification for Line Pipe
ASTM E 337	Test for Relative Humidity by Wet And Dry Bulb Psychrometer
ASTM G8	Cathodic Disbonding of Pipeline Coatings
NACE RP-02-74	Recommended Practice, High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation.
NACE RP-0490-95	Holiday Detection, of Fusion Bonded Epoxy External Pipe Coatings at 250 to 760 micrometers.
NACE RP-01-88	Discontinuity (Holiday) Testing of Protective Coatings.
SSPC-PA-2	Measurement of Dry Paint Thickness With Magnetic Gauges.
SSPC-SP-1	Solvent Cleaning
SSPC-SP-10	Near White Metal Blast

3.0 QUALITY PROGRAM

A quality control program shall be submitted to the COMPANY for review and approval prior to first production. The program shall be in accordance with ISO 9000/9001:9002 as the appropriate standard.

The quality program shall, as a minimum, include the following:

- a) Raw material handling procedures
- b) Raw material testing
- c) Coating application procedures
- d) Inspection and testing procedures
- e) Inspection and testing equipment calibration
- f) Coating repair procedure
- g) Handling and stockpiling
- h) Personnel qualification

4.0 **DESIGN REQUIREMENTS**

- 4.1 The FBE coating shall be capable of withstanding a maximum continuous operating temperature (i.e. design temperature) of 50°C.
- 4.2 The FBE shall be capable of withstanding the cyclic operating temperature range between 5 °C and 50 °C for the complete design life.
- 4.3 The FBE thickness shall be not less than 0.4 mm (400 micron).
- 4.4 The FBE coated pipe bends will be installed using conventional lifting and laying equipment.

5.0 **QUALIFICATION REQUIREMENTS**

5.1 **General**

- The coating procedure shall address the following points as a minimum:
- Pipe bends handling, storage and inspection at all stages of application work.
 - Complete details of the coating materials together with quality control, storage of materials, Manufacturer's certification and safety sheets.
 - Application of FBE coating including details of thickness, density, bonding strengths and details of application equipment.
 - Inspection and testing including instrument and equipment types, frequency and acceptance criteria.

- Details of instrument and equipment calibration methods including relevant standards and examples of calibration certificates.
- Complete details of inventory of laboratory and testing equipment.
- Quality control procedures including documentation, batch identification and qualification of personnel for all aspects of the work.
- Coating repair procedures and acceptance criteria for repair and rejection.
- First Day Production Tests
- Field testing

5.2 Coating Procedure Specification

- 5.2.1 A detailed coating procedure shall be prepared by the VENDOR for qualification and COMPANY approval.
- 5.2.2 The VENDOR shall submit certified records of all aspects of the qualification procedure to the COMPANY for approval.
- 5.2.3 Any failure to meet any part of the qualification procedure shall require the VENDOR to revise the procedure and repeat the qualification process.

6.0 MATERIALS

The FBE material shall be a fast gel time material and have the following properties:

Powder Density	1450 kg/m ³	
Tensile Strength @ 45 °C	40 Mpa	ASTM D2370
Elongation	6%	ASTM D2370
Hardness (1/8" ball, 100 kg load)	48-50 Rockwell	
Adhesion (lap shear)	185 kg/cm ²	ASTM D1002
Impact Resistance at 25 °C	18J	ASTM G14-72
Water Absorption at 65 °C	3.0%	ASTM D570

7.0 COATING APPLICATION

7.1 Surface Preparation

- 7.1.1 The external surface of the pipe bend shall be cleaned of all oil grease and paint by the VENDOR prior to abrasive cleaning. A solvent shall be used in accordance with SSPC-SP-1.
- 7.1.2 Each joint shall be uniformly heated to completely remove all moisture and to prevent any condensation of moisture on the pipe bend, prior to abrasive cleaning. The temperature of the substrate shall be a minimum of 3 °C above the dew point during surface preparation, application and drying. The temperature, dew point, and relative humidity shall be determined with a sling psychrometer or other approved equal following procedures in ASTM E-337. Readings shall be taken at the start of work and every four (4) hours thereafter. Preheated pipe temperatures shall not exceed 66 °C. Any abrasive entering the pipe shall be removed prior to coating.
- 7.1.3 The exterior pipe bend surface shall be abrasive cleaned to a "near white metal finish" Class 2½ using steel grit or dry sand as described in SSPC-SP-10 to remove all dirt, mill scale, rust, corrosion products, oxides, paint and other foreign and deleterious matter. The compressed air for cleaning shall be free of water and oil. Adequate separators, filters, or traps shall be provided.
- 7.1.4 The abrasive working mix shall be selected to produce an anchor pattern profile of not less than 0.038 mm and not greater than 0.064 mm.
- 7.1.5 To ensure a consistent surface finish and anchor pattern a stabilized abrasive working mix shall be maintained by frequent small additions of new grit (dry sand or steel) commensurate with abrasive consumption. Infrequent large additions shall be avoided.
- 7.1.6 The abrasive working mix shall be maintained clear of contaminants by a continuous and effective operation of the abrasive machine scalping and air wash separators.
- 7.1.7 After cleaning and prior to coating, the cleaned pipe shall be inspected by VENDOR under ample lighting conditions to ensure that all the cleaning steps have been adequately performed.
- 7.1.8 The abrasive cleaned surface shall not be contaminated with dirt, dust, metal particles, oil, water or any other foreign matter from any source, nor

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shall the anchor pattern be destroyed or burnished by pipe transport systems, processing equipment, tools, or follow-up cleaning with abrasive sanders.

- 7.1.9 Following abrasive cleaning and prior to the coating application, all dust, grit, metal particles or other loose contaminants remaining on the surface or entering the interior of the pipe shall be blown off with clean, dry, oil-free compressed air in a manner not affecting the other cleaned pipe or pipe to be coated. When compressed air cleaning facilities are not available, vacuum cleaning or other suitable methods may be used.
- 7.1.10 Improperly cleaned pipe shall be re-cleaned at the expense of the VENDOR. The cleaned pipe shall be immediately transferred to the coating racks. Under no circumstances shall the total elapsed time from the start of cleaning to the application of coating exceed the following time humidity table:

<u>Relative humidity %</u>	<u>Time hours</u>
90	1
85	2
80	4
70	10

- 7.1.11 Any raised sliver, scabs, laminations or bristles of steel remaining on the newly cleaned pipe surface shall be removed using abrasive sanders. This operation shall not burnish or destroy the surface anchor pattern.
- 7.1.12 Any surface preparation which does not conform to these specifications (just prior to coating) shall be rejected. Grease-free chalk shall be used to mark areas which do not meet the specified requirements.
- 7.1.13 The external pipe surface shall be abrasive cleaned to SIS standard 05 5900-Sa 2½.
- 7.1.14 It is very important that the specified surface cleanliness exists at the point of coating application. The period between cleaning and coating shall be kept to a minimum.

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7.2 FBE Coating Application

- 7.2.1 The FBE coating shall be applied to the preheated pipe bend in a uniform manner by electrostatic powder spray to produce the specified thickness (0.4 mm).
- 7.2.2 In no event shall the percentage of recycled powder mixed with new powder exceed 25 percent.
- 7.2.3 The FBE coating shall be applied over the full length of each pipe bends joint and the cutback of 50 mm.
- 7.2.4 Frothing of the coating at the steel/coating interface shall be avoided.
- 7.2.5 All compressed air used for delivery of FBE in the coating chamber shall be free from moisture, oil and other contaminants.
- 7.2.6 Quenching with water shall be performed only after the recommended minimum cure time has elapsed.

8.0 INSPECTION

The quality program shall define the inspection plan which shall include the following:

- a) Each pipe bend shall be visually inspected over 100 percent of the surface after application of FBE.

The FBE coating shall be visually inspected for defects under adequate lighting and shall be free of voids, loss of adhesion, blistering, excess powder mounds, peeling, blueing, lifted pipe scabs, and discoloration from burning or rusting of substrate.

If the VENDOR fails to promptly correct causes of regularly recurring holidays or other coating defects, the pipe coating may be rejected for any number of such regularly recurring holidays or defects.

- b) The dry coating thickness of FBE shall be measured with a magnetic film thickness gauge such as magnetic film thickness gauge. The gauge shall have a zero to 1.0 mm working range and shall be calibrated frequently against the approximately 0.4 mm standard of the U.S. Department of Commerce Certified Coating Thickness Calibration Standards for non-magnetic Coating of Steel or EPC Contractor accepted alternative standards with the consent of the Owner.

The standards shall be in the 0.35 mm to 0.45 mm range, unless otherwise specified.

A minimum of six (06) dry film thickness measurements shall be taken on each pipe bend. Three sets of readings shall be taken evenly spaced along the length of each pipe. Each set of readings shall consist of four readings equally spaced around the circumference of the pipe bend. All dry thickness readings shall be performed in accordance with SSPC-PA2 using the spot reading frequency specified herein.

- c) All FBE coated pipe bends shall be 100% inspected for holidays using a spiral coil or brush operated according to the requirements of NACE Recommended Practice RP-02-74. A 150 volts/mil, or as recommended by the coating manufacturer, shall be used. In no case shall the voltage be below 2100 DCV. The holiday detector shall have an audible alarm.

The holiday detector voltage shall be measured and recorded every hour with an accurate DC voltmeter. The holiday detector shall be re-calibrated as necessary after recording its voltage or during noticeable changes in handling.

The detector electrode shall be in direct contact with the entire surface of the coating being inspected. There shall be no gaps in the electrode or separations between the electrode and the surface of the coating, including the surfaces on either side of the seam of the pipe.

The travel rate of the detector's electrode shall not exceed 0.30 meters/second and shall not be allowed to remain stationary while the power is on. (Refer to NACE RP-02-74 to determine rate of travel).

All holidays and other coating defects shall be marked with a grease-free marker and the number and nature of holidays and coating defects in each pipe recorded.

Pipe spools not meeting the requirements below shall be rejected:

- The number of holidays shall be limited to one per 1.86 square meters for any given pipe. The size of the holiday shall not exceed 25 mm²

- d) The ends of each pipe shall be inspected after each coating has been cut back. The inspection shall check that the fusion bonded epoxy coating has not been damaged. Cut backs shall be free from FBE or other foreign material.

9.0 TESTING

9.1 General

- 9.1.1 Material and production testing shall be performed at regular intervals as per the VENDOR's procedure approved by COMPANY.
- 9.1.2 All tests shall be performed by qualified personnel.
- 9.1.3 Any pipe bend not meeting the requirement of this Specification shall be stripped, cleaned and re-coated.
- 9.1.4 The VENDOR shall prepare a prototype test procedure for the field joint coating system to qualify the application procedures.
- 9.1.5 The VENDOR may provide documentation supporting a similar system used for a previous contract in lieu of complying with clause 9.1.4, if the design requirements were similar to those defined in Section 4.0.

9.2 Prototype Testing

The VENDOR shall prepare a testing procedure and perform tests to qualify the field joint materials and application procedure. The testing shall cover the following:

- a) Coating and field joint material compatibility
- b) Field application procedures
- c) Structural integrity during and after installation
- d) Cut back design

10.0 COATING REPAIRS

10.1 General

- 10.1.1 The VENDOR shall submit a repair procedure for approval prior to the start of production.
- 10.1.2 The VENDOR shall demonstrate that the repair is as strong as the parent material.

10.1.3 Where a pipe is to be stripped and re-coated, the pipe shall in no circumstances be heated to above 246 °C.

10.2 Field Repair of Coating

10.2.1 The vendor shall submit a comprehensive procedure for field repair of coating, and specifications of all the repair materials involved.

10.2.2 Vendor shall include in his supply, repair materials to adequately cover the coating damage normally expected during transportation

10.3 Repair of FBE Coating

10.3.1 Areas of pipe bends requiring small spot repairs shall be cleaned to remove dirt, scale and damaged coating using surface grinders or other suitable means. The adjacent coating shall be feathered. All dust shall be wiped off. For pinholes only, surface preparation is not required other than removing surface dirt, oil, grease and other detrimental contaminants which impair the adhesive of the repair material.

10.3.2 Pipe bends with major coating defects such as uneven coating, disbanding or inadequate film thickness shall be set aside for stripping and re-coating. All repairs shall be re-subjected to the original acceptance criteria.

10.3.3 When stripping a pipe bend for re-coating the pipe bend shall not be heated above 246 °C.

10.3.4 For all defects a two part liquid epoxy compound shall be applied using a hand gun applicator. The defect area must be first abraded by hand using a carborundum cloth. The compound shall be applied to a minimum thickness of 0.5 mm and overlap the undamaged area by 25 mm.

10.3.5 Pipe bends having major coating defects (e.g. partially coated, disbanding or inadequate film thickness) shall be set aside for reprocessing.

11.0 IDENTIFICATION AND MARKING

11.1 The pipe bend will be delivered to the VENDOR marked in accordance with the marking system. The VENDOR shall maintain the pipe identification throughout the process of cleaning and coating of the pipe. If the pipe identification is removed during the coating operation, it shall be replaced.

11.2 Additional markings shall be applied 50 mm from the end of the coating and outside the pipe at each end. Letters and numerals shall be 25 mm in height.

- 11.3 Pipe which has undergone repair in accordance with section 10.0 shall be marked with a band painted around the entire circumference of the coated pipe and not more than 75 mm from the cut back at each end.
- 11.4 All markings shall be stenciled and spray applied with a paint compatible with the coating material and of a contrasting colour.

12.0 STORAGE, HANDLING AND SHIPPING

- 12.1 The coated pipe bends shall at all times be handled in a manner to avoid damage to the coating.
- 12.2 The coated pipe bend shall be supported only by the uncoated ends until the coating has cooled to ambient temperature.
- 12.3 The coated FBE shall be stored in an area which will not result in accumulation of dust or dirt either from the environment or surrounding.
- 12.4 The FBE coated pipe shall be protected to avoid degradation from ultraviolet light radiation.
- 12.5 Any coated pipe section that shows contamination in any form whatsoever from the environment or surrounding shall be adequate grounds for stripping the entire coating and completely re-coating the pipe bend as considered appropriate by COMPANY representative.
- 12.6 All coated pipe which has undergone repair shall be stockpiled separately from non repaired pipes or shall be coloured coded for ease of identification.
- 12.7 The handling and shipping of coated and uncoated pipe shall be in strict accordance with the applicable Specifications. VENDOR shall ensure that all coated pipe is loaded into containers and is in accordance with procedures approved by COMPANY.

13.0 DOCUMENT SUBMITTALS

13.1 The VENDOR shall submit copies each of the following documents to ICP.

<u>Document</u>	<u>Submittal</u>	<u>No. Copies</u>
Quality Control and Application Procedures	With Bid	2
Coating Repair Procedures	With Bid	2
Storage, Handling and Transportation Procedures	Prior to Coating	2
Qualification Test Report	Prior to Coating	2
Certified Material Test Certificates	Prior to Coating	2
Certified Inspection Report	Weekly	1
Tally Recorded of Pipe bend Received	Weekly	1
Tally Recorded of Pipe bend Coated/Loaded Out	Prior to Shipping	6
Coating Repairs Undertaken	Reported Daily	1

All certificates shall be in English language and with SI units of measure. Certificates shall be visibly signed by the VENDOR.

13.2 The VENDOR shall maintain a complete record of the pipe bends from the time it first enters the coating yard until the completion of load-out of coated pipe bends. The VENDOR shall provide this information to the COMPANY according to the schedule specified above.

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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
WELDING FITTINGS**

**ISSUED FOR
REVIEW**

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1.0 SCOPE

This specification covers the requirements for factory-made wrought steel Butt welding fittings and for transition pieces.

All fittings shall be manufactured in accordance with the latest edition of ANSI B16.9 and the relevant ASTM standards, as applicable, and as further specified below.

2.0 DEFINITION

Refer to the Contract Agreement.

3.0 DESIGN

Fittings shall be designed to suit the grade, diameter and wall thickness of the rating pipe as specified in the specifications. Weld end preparation shall be in accordance with ASME/ANSI B31.3 and B31.8.

4.0 MATERIALS

Steel used in the manufacture of fittings to this specification shall be fully killed and made by the open hearth, electric furnace or basic oxygen processes as per ASTM A234 GR. WPB.

The chemical composition of each heat of steel shall be determined by the Manufacturer, and shall have maximum carbon content 0.02%, and maximum sulphur content 0.02%.

The carbon equivalent shall not exceed 0.43% as determined by the following formula:

$$C.E. = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

5.0 HEAT TREATMENT

Fittings shall be furnished in the heat treated condition.

6.0 DIMENSIONS

6.1 Dimensions shall be generally in accordance with ANSI B16.9.

6.2 In all cases fittings shall be suitable for butt welding into the adjacent pipework with the internal diameter of ends and outlets matching that of the pipe.

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7.0 TRANSITION PIECES

Where pipes of different material grades, or of different wall thickness (or both) are to be joined, and where the mis-match of wall thickness cannot be rectified by grinding in accordance with the tolerances of ANSI B31.3 or B31.8, then a transition piece shall be used.

The transition piece shall have a length of at least 2 pipe diameters and shall have a minimum specified yield strength equivalent to the thinner of the two pipes to be joined. The ends of the transition pieces shall be machined to suit the respective pipe wall thickness.

8.0 TESTING AND INSPECTION

8.1 A check analysis shall be furnished for each heat of steel used in producing the fittings.

8.2 All fittings supplied in this specification shall be subject to inspection by the Owner or his representative at Suppliers works.

9.0 CERTIFICATION

The Supplier shall provide a certification of compliance with ANSI B 16.9, and the relevant ASTM standards and with the requirements of this specification.

10.0 MARKING

Each fitting shall be marked in accordance with ANSI B16.9, the relevant ASTM standards and as may be further specified in the Tender Document.

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 Zishan Engineers (Pvt.) Ltd. An ISO 9001-2015 certified company, 47/F, Block 6 PECHS, Karachi-Pakistan Tel: (92-21) 3459045-48 & 34310151-54 Fax: (92-21) 34551430 & 34110156 E-mail: contact@zishanengineers.com, Web: www.zishanengineers.com	Document No.	ZSS-B-SPM-021
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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

SPECIFICATION FOR
ISOLATING COATING FOR PIPE RESTING ON PIPE
SUPPORT AND SADDLE

ISSUED FOR REVIEW

A	03-03-2020	Issued for Review	MR	AK	AH
Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 **GENERAL**

- 1.1 This specification defines the requirements for isolating pipe resting on pipe support. The system shall ensure that the pipe is effectively isolated from the pipe support for the life of the pipeline system.
- 1.2 The coating system shall consist of:
 - A Corrosion preventing wrapping band
 - A mechanical protection Outer Wrap
 - A glass-fibre reinforced outer wrap cloth

2.0 **DEFINITION**

Refer to the Contract Agreement.

3.0 **MATERIALS REQUIREMENTS**

The materials to be supplied shall comply with the requirements of Table-1

3.1 **Visco-Elastic Corrosion Prevention Wrapping band**

This shall consist of a cold applied, non-toxic corrosion preventing wrap coating material STOPAQ CZH that has cold-flow, self-healing, visco-elastic properties and is based on polyisobutenes, which are non-crystalline, fully amorphous, and non-cross linked low viscosity polyolefin type STOPAQ CZH.

The wrapping band and complete coating shall meet the requirements of Table-1

3.2 **Mechanical Protection Outer Wrap**

This shall consist of a flexible cold applied tape STOPAQ Outer wrap for providing additional mechanical protection. The tape shall be self adhesive and shall have a PE backing coated with a pressure sensitive Butyl rubber resin based adhesive. It shall have high adhesion to the wrapping band.

The Outer Wrap shall meet the requirements of Table-2.

3.3 Glass-Fibre Reinforced Outer wrap Cloth

This shall consist of a STOPAQ Outerglass Shield XT solvent free pre-impregnated bi-axial woven glass-fibre reinforced outerwrap wrapping cloth, curing to a hard shield by means of a water activated polyurethane resin.

All materials supplied shall be strictly in accordance with this specification.

4.0 APPLICATION METHOD

- Clean the surface of the bare steel to a cleanliness of St-2 / St-3 standard (by means of hand / machine wire cleaning) or to a Sa-1 standard by means of abrasive blasting ("brush-off" blasting), in accordance with ISO 8501-01. With visco-elastic materials it is not necessary to measure the anchor profile.
- Finally, carry out a "Dust" test on the cleaned surfaces. Pieces of adhesive tape shall be applied on different places on the cleaned surface. When removing the tape pieces, the contamination on the tape indicates the degree of loose dust remaining on the surface and if additional dust cleaning is required.
- Epoxy lined substrates shall be de-glossed and roughened with a light abrasive sweep blasting or by abrading with sand paper and clean and degrease surface with SFL Substrate Cleaner, SFL Cleaning Wipes or Isopropanol. An abrasive cleaning pad can be used. Do not use any other solvents.
- Prior to and during application, surface to be coated shall be maintained at a temperature at least +3 °C above the dew-point temperature and between -30 °C and +70 °C

4.1 Visco-Elastic Corrosion Prevention Wrapping band

- 4.1.1 Before and during application, wrapping band shall be maintained within the temperature range +5 °C to +70 °C
- 4.1.2 Wrapping band shall be applied with the sticky side in contact with the substrate, wrapped without tension, avoiding air entrapment and without wrapping band creases and wrinkling.
- 4.1.3 Wrapping band shall be wrapped with an overlap of 50%. It shall overlap at least 50mm onto adjacent existing pipe coating. Overlaps between the end of a tape roll and the tape of a new roll shall be at least 100mm. The entire length of the pipe + additional 100mm on each side shall be coated. Start with a circumferential wrap of Wrappingband at the 10 o'clock

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position.

- 4.1.4 At terminations (start and end points) one, full straight wrapping shall be applied onto substrate, followed with wraps from "straight to spiral" and then continuing with spiral wrapping, with 10mm minimum overlap. End with one straight, circumferential wrapping.
- 4.1.5 Quality control Holiday Detection High voltage test shall be carried out on the wrapping band directly after application! At this stage in the coating process, holidays / gaps can easily be localized. Any holiday shall be repaired with the addition of new material and retested.
- 4.1.6 The High voltage Holiday test shall be done at 15kV. A clean, copper-brush probe is recommended for the holiday testing. In case a ring-probe is used, the test voltage shall be 20kV in order to compensate the less efficiency of a ring probe.
- 4.1.7 Quality control Holiday Detection High voltage test shall be carried out on the wrapping band directly after application! At this stage in the coating process, holidays / gaps can easily be localized. Any holiday shall be repaired with the addition of new material and retested.
- 4.1.8 The High voltage Holiday test shall be done at 15kV. A clean, copper-brush probe is recommended for the holiday testing. In case a ring-probe is used, the test voltage shall be 20kV in order to compensate the less efficiency of a ring probe.

4.2 Mechanical Protection Outer Wrap Application:

- 4.2.1 Prior to start of application, check the cleanliness and temperature of the surface to be coated is according to the same guidelines as prior to the wrapping band application.
- 4.2.2 Application of Outer wrap shall be done WITH tension. The first wraps of the Outer Wrap shall be done without advancing the roll. Always start the wrapping three to five millimeters inside the end of the corrosion prevention wrapping band. Start with two circumferential wraps around the pipe.
- 4.2.3 Apply the subsequent outer wrap under tension, spiral-wrapping by advancing the roll, with an overlap of minimum 50%. In this way a double layer of wrapping band will be created. Subsequent rolls should overlap the previous tape-end by minimum 25 cm.

4.2.4 During the entire wrapping process, the applicator should apply the Outer wrap as smoothly as possible, avoiding air enclosures. It is important that optimal adhesion is achieved between the overlapping Outer wrap layers as well as the adhesion to the corrosion prevention wrapping band layer. This will ensure optimal performance of the mechanical protection layer.

4.2.5 The wrapping should end 3-5 mm inside the wrapping band, with two, NON-TENSIONED, circumferential wraps around the pipe and cut the end as a tie.

A final visual quality control check should be carried out by a trained and certified inspector approving and reporting the quality of application, confirming that no further tests are needed and the coated section can be accepted.

4.3 Glass Fibre Reinforced Outer wrap

4.3.1 Consult Safety Data Sheet and Product Data Sheet for appropriate safety measures, personal protective gear, application conditions etc. Clean and wet the surface of the pipe previously coated with wrapping band and outer wrap as explained in 4.1 and 4.2 above.

4.3.2 Remove the Outerglass Shield XT from its pouches just before application. Start with 2 circumferential wraps at one end. Keep 3mm wrapping band exposed. Apply with Tension. Continue wrapping spirally towards the other end with tension and a minimum overlap of 50%. Keep wetting the Outerglass shield with water and keep 3mm wrapping band exposed

4.3.3 Wrap compression foil immediately after application of Outerglass Shield XT in the same direction as the Outerglass Shield XT. Start beyond the extremity of the Shield XT and wrap with tension. Finish beyond the extremity of the Outerglass Shield.

4.3.4 Use puncture roller to cautiously perforate the compression foil. Only perforate the compression foil and not the outer and wrappingband.

4.3.5 Remove the compression foil after the outerglass Shield XT has cured

4.3.6 If pipe will be above ground exposed to UV, paint the coated pipe with a UV resistant topcoat

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5.0 STORAGE

Material shall be suitable for storage at ambient temperatures ranging up to 40°C with 90% humidity. Under such storage condition of temperatures and humidity the material shall NOT show deterioration of any kind that would render the material unsuitable as an anti-corrosion material.

6.0 PACKING AND MARKING:

6.1 Wrapping band, outer wraps and cans shall be packed in cartons unaffected by weathering. Reinforced cartons shall be packed on a pallet which shall have all weather proof covering.

6.2 Each carton and pallet to be clearly marked with the contents.

7.0 INSPECTION AND TESTING OF MATERIALS

7.1 General

Owner shall have the right to inspect at all times, any tools, instruments, materials or equipment used or to be used in the manufacturing process.

Owner shall have the right to condemn any or all tools, instruments, materials, equipment or work which does not conform to this Specification.

Any condemned material not conforming to this Specification shall be rectified by the Manufacturer at no expense to the Owner. Any condemned tools, instruments, materials or equipment shall be replaced or rectified.

7.2 Product Qualification Testing

To ensure that the materials that are supplied are as per the requirements of this specification, Owner reserves the right to carry out at any time whether on the samples submitted with the bid, or subsequently as part of the order, tests of any of the parameters detailed in this specification.

7.3 Finger printing of materials

In order to ensure that the materials offered is actually the one supplied; Owner shall have the right at any time to have fingerprinted using Infra Red spectroscopy techniques, the materials to be supplied or being supplied.

TABLE - 1

Performance requirement of Corrosion Prevention Wrappingband

Property	Test Temp.	Unit	Requirements	Test Method
Minimum thickness	23 °C	mm	> 1.5mm	ISO 21809-3 Annex A
Glass transition temperature		°C	< -60°C	ISO 21809-3 Annex E
Melting Point		°C	No melting point present	ISO 21809-3 Annex E
Holiday detection at 5 kV/mm + 5 kV		-	No holiday	ISO 21809-3 Annex B
Drip resistance	$T_{max} + 15$ °C		No dripping of compound	ISO 21809-3 Annex J
Peel strength test to steel and to plant coating before and after thermal ageing resistance and hot water immersion test both for 100 days at $T_{max} + 20$ °C (if reinforcement in the polyolefin coating)	23 °C T_{max}	N/mm N/mm	≥ 0.2 ≥ 0.02 Cohesive failure Coverage ≥ 95 %	ISO 21809-3 Annex D (and Annexes N3 and I)
Adhesion test to steel and to plant coating before and after thermal ageing resistance and hot water immersion test both for 100 days at $T_{max} + 20$ °C (If no reinforcement in the polyolefin coating)	23 °C T_{max}		The coating shall leave a film of corrosion protective coating material on the substrate. There shall be no evidence of adhesive failure	ISO 21809-3 18.5.9.2 (and Annexes N3 and I)
Lap shear strength	23 °C T_{max}	N/mm ² N/mm ²	≥ 0.02 ≥ 0.002 Cohesive failure Coverage ≥ 95 %	ISO 21809-3 Annex L
Density	23 °C	gm/cc	1.4-1.6	NEN1833
Elongation	23 °C	%	>100	ASTM D-1000
Moisture absorption	23 °C	%	<0.03	ASTM D-570
Permeability	23 °C	g/m ² /24hrs	<0.25	ASTM E-96

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Property	Test Temp.	Unit	Requirements	Test Method
Specific electrical resistance	23 °C	oh-m ²	$R_{S100} > 10^3$	ISO21809-3 Annex K
Application temperature suitability test			No sagging/slippage, no dripping	As per para 3.3
Service temperature			Upto 70°C	
Application temperature range			-5 to 70°C	

For the purposes of this specification, $T_{max} = 70^{\circ}\text{C}$

TABLE - 2

Performance requirement of Complete Coating System

Property	Test Temp.	Unit	Requirement	Test Method
Impact Resistance	20°C	Joule	$>= 15$	ISO 21809-3 Annex G
Indentation resistance, pressure - Holiday detection at 5 kV/mm + 5 kV - Residual thickness	23 °C and T_{max}	N/mm ² mm	1.0 no holiday ≥ 0.6	ISO 21809-3 Annex H
Cathodic disbondment resistance at 28 days	23 °C and T_{max}	mm	0 mm, no holiday, self healing	ISO 21809-3 Annex F (and Annex B and 18.5.7)

For the purposes of this specification, $T_{max} = 70^{\circ}\text{C}$

TABLE - 3

Performance requirement of Mechanical Protection Outerwrap

Property	Test Temp.	Unit	Requirement	Test Method
Outerwrap - PE				
Peel strength - outer layer to outer layer - outer layer to outer layer - outer layer to backing polyolefin coating - outer layer to backing polyolefin coating	23 °C T_{max} 23 °C T_{max}	N/mm N/mm N/mm N/mm	≥ 0.40 ≥ 0.04 ≥ 0.2 ≥ 0.02	ISO 21809-3 Annex M
Elongation at break (E_{100}/E_0) after thermal ageing test for 100 days at $T_{max} + 20$ °C.	23 °C	-	≥ 0.9	ISO 21809-3 Annex N.1
Peel strength ($P'_{100}/P'n$) after thermal ageing test for 100 days at $T_{max} + 20$ °C. - outer layer to outer layer - outer layer to backing polyolefin coating	23 °C	-	≥ 0.7	ISO 21809-3 Annex N.2 and Annex D
Tape thickness			0.5mm +/- 0.055mm	
Service temperature			-5°C to +70°C	

For the purposes of this specification, $T_{max} = 70^{\circ}\text{C}$

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TABLE - 4

Performance requirements of Glass-fibre reinforced outerwrap cloth

Property	Test Temp.	Unit	Requirements	Test Method
Thickness per ply	23°C	mm	0.3	
Curing time	25°C	hours	24	
Tensile modulus		GPa	15	
Tensile strength		MPa	220	
Chemical resistance			Acetone, MEK, Toluene, Gasoline, ethyl alcohol and other petrochemical products	

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K-ELECTRIC LIMITED

SPUR PIPELINE FOR SUPPLY OF RLNG TO 900MW CCPP

**SPECIFICATION FOR
CATHODIC PROTECTION**

**ISSUED FOR
REVIEW**

Rev.	Date	Description	Prepared By	Checked By	Approved By
A	03-03-2020	Issued For Review	AK	NAK	NAK

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1.0 GENERAL

1.1 Introduction

K-Electric Limited (KE) aims to develop a Spur Pipeline to fulfill the gas requirement of the 900 MW RLNG Combined Cycle Power Plant (900MW CCPP).

KE intends to engage an EPC Contractor for laying the Pipeline for supply of 250 MMSCFD RLNG at 85 bar from a suitable point at the RLNG Supplier's main pipeline which is connecting the Bin Qasim Power Station with the Custody Transfer Station, situated at 2 KM approximately. This spur pipeline shall connect the Delivery Point situated at KE's Bin Qasim Power Complex with the Main Pipeline through a tee-off connection as designated by RLNG Supplier in its facility.

KE has engaged Zishan Engineers (Pvt.) Ltd (ZEL) to provide basic engineering services for installation of above mentioned RLNG Pipeline & preparation of Tender Documents for Hiring of EPC Contractor to execute said project.

1.2 Scope

- 1.1.1 This Document outlines the minimum requirements for detailed design, supply, installation, testing and commissioning of cathodic protection system for the external protection of 2 KM RLNG buried spur pipeline.
- 1.1.2 Complete and functional cathodic protection system shall be provided by Contractor by installing sacrificial galvanic anode based CP system for KE's buried spur pipeline.
- 1.1.3 Contractor shall engage specialized designer for detailed engineering of the CP system. The detailed design and calculations shall be submitted to the Company for approval prior to execution of work.
- 1.1.4 All materials and equipment provided for the Cathodic Protection system shall be new, unused and free from defects.

1.3 Definitions

Refer to the Contract Agreement.

1.4 Errors or Omissions

- 1.4.1 The review and comment by COMPANY of any CONTRACTOR / VENDOR's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve CONTRACTOR / VENDOR of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.
- 1.4.2 Any errors or omissions noted by CONTRACTOR / VENDOR in this Specification shall be immediately brought to the attention of COMPANY.

1.5 Deviations

All deviations to this Specification, other related specifications or attachments shall be brought to the knowledge of COMPANY as a section in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of COMPANY prior to execution of Work. Such deviations shall be shown in the documentation prepared by CONTRACTOR / VENDOR.

1.6 Conflicting Requirement

In the event of any conflict, inconsistency or ambiguity between CONTRACTOR / VENDOR's scope of work, this Specification, Codes and Standards (referenced in the Project Specification) or any other documents, CONTRACTOR / VENDOR shall refer to COMPANY whose decision shall prevail.

1.7 Reporting Procedure

- 1.7.1 A reporting and documentation system shall be agreed between CONTRACTOR / VENDOR and COMPANY for the status of procurement, design, manufacturing, inspection, testing and shipment of the equipment / material to be supplied under this specification. CONTRACTOR/VENDOR shall provide reports and summaries for production performance and testing operations in conformance with a manufacturing schedule approved by COMPANY. Daily, weekly, monthly and run summaries of all major aspects of the production process shall be provided as reports to the COMPANY.
- 1.7.2 Daily, weekly, monthly and run summaries of all major aspects of the production process shall be provided as reports to COMPANY.

1.8 Unit Responsibility

CONTRACTOR shall be responsible for the complete design, manufacture, supply, fabrication, construction, installation / erection, inspection and testing of cathodic protection, including full compliance with all applicable design codes and standards, including those listed in subsequent sections of this document and the requirements of the certifying authority, if applicable. The CONTRACTOR / SUPPLIER shall handle and expedite drawings and data, and supervise and coordinate all inspection and testing.

VENDOR/CONTRACTOR shall guarantee that all material and parts included in construction shall be new, unused and of the required / specified grade.

1.9 Documentation

- 1.9.1 Documents, datasheets, drawings, etc., to be submitted to the COMPANY shall be in English Language.
- 1.9.2 Unless otherwise specified, the imperial units shall be used in documents and drawings, except that pipe sizes, flange sizes and bolts / nuts shall be indicated in inches.
- 1.9.3 The form of drawings and documents may be as per the CONTRACTOR / VENDOR's Standards. However, the format of the data sheet will be submitted to COMPANY for approval.
- 1.9.4 Variations from or additions to this specification shall be called to the attention of the COMPANY and approved in writing by the COMPANY prior to starting fabrication.
- 1.9.5 Information for installation, operating, maintenance or inspection purposes shall be submitted to COMPANY.

2.0 CODES AND STANDARDS

2.1 Codes, Standards and Regulations

The cathodic protection system shall be designed, manufactured and tested in accordance with the requirements of this specification, other referenced Project Specifications and the Latest Editions of following Codes, Standards and Statutory Regulations (where applicable):

- API RP651 : Cathodic Protection of Aboveground Petroleum Storage

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This shall include but not limited to following:

- Carrying out soil resistivity survey of the KE installation area and along the pipeline routes.
- Verification of the design basis and modification as required, to comply with requirements of the standards recommended industry practices.
- Detailed engineering of the system and submission of design documents for Company's approval. The design shall take due consideration of the overall plot plan and other aspects of the facility design to avoid any clashes with other works during construction.
- Supply of all equipment, material, etc. and installation of the complete systems as per approved design.
- Factory Acceptance Testing of supplied equipment/materials.
- Installation, testing and commissioning of complete system.

The CP system to be supplied by the Contractor/supplier shall afford protection to following, as a minimum:

- Approximately 2 km buried pipeline from RUNG supplier to K-Electric BQPS station. (Sacrificial Anode System)

5.0 DESIGN BASIS

5.1 CP Method

Galvanic type CP shall be applied for buried piping, which shall comprise sacrificial anodes to provide DC current to the piping buried in soil. Sacrificial Mg anode shall be used for the piping buried in soil.

5.2 Protective Criteria

CP system shall be designed to meet the protection criteria achieving a negative polarized (instant-off) potential referred to a reference electrode in contact with electrolyte and to maintain such potentials throughout the design life.

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Table 5.1 CP Protective Criteria

Protected Structure	Off Potential mV		Versus Reference Cell
	Min	Max	
Protection for buried pipeline	-850	-1150	Measurement to CSE

5.3 Design Parameters

Design Life:	30 years
Coating:	3 Layer Polyethylene (3LPE) – Pipeline 3-layer tape of polyethylene material – Terminal piping
Soil resistivity:	As per actual measurements, to be conducted by Contractor
Isolation:	All buried pipes/pipelines to be isolated from the above ground portions using insulation flanges
Plant Grounding:	To be isolated from the buried portions of the pipes

5.4 Protective Current

The evaluation of the current demand necessary for the CP shall be carried out from the design input data.

The current CP requirement shall be estimated by Contractor as per the coating status and applicable coating breakdown factors specified in the relevant codes. Following is only a preliminary baseline minimum requirement

Current Density:	20mA/m ² (Bare Steel) 1mA/m ² (Coated buried piping)
------------------	---

Notes:

1. The current density value shall be increased by 25% per 10 °C rise in temperature above 30 °C;
2. Nominal industry standard values for the coating breakdown factor are 1- 2% initial, with 1% annual increase.

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6.0 CATHODIC PROTECTION EQUIPEMENT SPECIFICATIONS

6.1 Cathodic Protection Cables

Cables for cathodic protection system shall be cross-linked polyethylene-insulated, PVC unarmored copper conductor type (XLPE / PVC), with cross sections depending on the current carried and the circuits resistance limits. The minimum conductor size for cables shall be as follow:

- 50 mm² for Positive cable and Negative cable;
- 10mm² for Test cable

6.2 Junction Box

Junction box shall comprise a terminal junction box sealed to IP65 against the ingress of dust and moisture and be provided with required number of circuits. Each circuit shall have shunts and grid coil resistors to monitor and control the current.

All variable resistors and shunts shall be mounted on a non-metallic panel board, complete with copper bus bar, bolts / nuts and connection studs suitable for connection of specified sizes of copper cables.

6.3 Test Station

Test station serviced as a part of CP monitoring system, and it shall be installed aboveground close to the tank. Test station shall be rugged design, high strength and maintenances free for monitoring tank potentials.

Each test station shall be embodied with a terminal board with 10 No. terminals.

6.4 Magnesium Anodes

Magnesium anodes shall be installed simultaneous with the pipeline / piping installation. The anodes shall be of the high potential type (Galvomag or equivalent) with a minimum open circuit potential of -1.7 volts negative to a Cu/CuSO₄ reference electrode.

The anodes, either for temporary or permanent installations, shall be connected to the pipeline through a suitable test station with provisions for anode current output measurement. Anodes must not be welded directly to the pipeline.

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6.5 Backfill

The backfill used with magnesium and zinc anodes shall comply with the following composition requirements:

- 75% gypsum ($\text{CaSO}_4 - 2 \text{H}_2\text{O}$)
- 20% bentonite
- 5% sodium sulphate (Na_2SO_4)

The weight of backfill surrounding each anode shall be at least equal to the net weight of the anode and be contained in a cotton bag or a metal canister.

6.6 Test Facilities

Test facilities shall be installed to include the following installations:-

- 6.6.1 Isolating joints.
- 6.6.2 Pipeline sleeves.
- 6.6.3 Foreign pipeline, road and water crossings parallel or crossing the pipeline.
- 6.6.4 Magnesium anode test stations with current measuring shunts.

6.7 Isolation of pipes/ pipeline

The buried sections of the pipes shall be isolated from the above ground piping as well as from the rest of the buried structures (including the electrical grounding). Plant electrical grounding shall not be connected to the protected parts of the piping.

7.0 PRE-COMMISSIONING, STARTUP, COMMISSIONING & HANDOVER

CP system pre-commissioning and commissioning shall be performed in accordance with the requirements of operational documents and manuals by professional company employed by the Contractor.

CP system pre-commission and commissioning include preliminary equipment and circuits checking, energizing the CP systems and adjustments, measurement of protection potentials and so on. And the CP commissioning and pre-commissioning procedure shall be submitted for Company's review and approval.

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K-ELECTRIC LIMITED

8.0 SPARE

Spare equipment which shall be in addition to the specific requirements. Schedule of Spare Equipment a quantity of ten percent of the total equipment supplied shall be provided.

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Tanks

- BS 7361-1 : Cathodic Protection Part-1: Code of Practice for Land & Marine Application.
- NACE RP 0169 : Control of External Corrosion on Underground or Submerged Metallic Piping System.
- NACE RP 0286 : The Electrical Isolation of Cathodically Protected Pipelines.
- NACE RP 0193 : External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms.

2.2 In addition to the requirements of this General Specification, all requirements of the governing Statutory Authority, i.e., in the country and / or its subdivision where painting are to be applied, shall be met.

2.3 **Project Documents**

Contractor/Supplier shall refer the documents, attached with the tender for design of the CP System.

3.0 **ENVIRONMENTAL AND UTILITY DATA**

3.1 **Environmental Data**

The equipment proposed shall meet the following service conditions:

- Average Temperature: 90°F during day time
- Peak Temperature: 113 °F
- Relative Humidity: Equipment shall be suitable for high humidity 45% to 90% RH, and dusty harsh weather conditions.

4.0 **SCOPE OF SUPPLY/SERVICES**

The general scope defined herein shall cover all aspects of the Cathodic Protection System in compliance with listed codes & standards. All technical requirements mentioned in this document shall be considered as minimum and Contractor shall be responsible to furnish any other supply / services, as required to furnish a fully functional system.

Subject: PAY ORDER / BANK DRAFT

Please find attached herewith a copy K- Electric Limited application No. nil dated May 18, 2020 alongwith a Pay order / Bank Draft of Rs.750,000/- bearing S.C No. 01706472 dated 18-05-2020 issued by Habib Bank Limited State Life Branch, Branch 0042 as process fee for grant of License to K-Electric Limited for Construction and operation of a transmission pipeline.

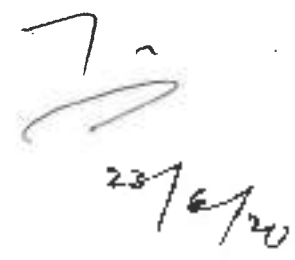


(Abdul Malik Sherani)
Law Officer (Registrar Office)
June 23, 2020

Accounts Officer, OGRA

Received Pay Order / Bank Draft (In Original)

Joint. Executive Director (Accounts)



Account Payee Only



HBL HABIB BANK
STATE LIFE BRANCH

0042

S.C. No. 01706472

Stationary No: 01706472

1 8 0 1 8 2 0 0

Pay to Oil and Gas Regulatory Authority

or Order

Pakistan Rupee Seven Hundred Fifty thousand only

PKR *****750,000.00

Payable at any HBL Branch in Pakistan
Centralised Cheque Payable Account
30019903905586

Signatory
PA No. 20653

Signatory
PA No. 17188

Please do not write below this line.

⑈01706472⑈054300⑈00300⑈19903906586⑈010⑈

HBL HABIB BANK

STATE LIFE BRANCH

0042

By Order Oil K-Electric Limited

01706472

Smart Cheque

Customer Advice

Cheque No. 01706472
Date 16-05-2020

WE CONFIRM HAVING ISSUED THE FOLLOWING SMART CHEQUE AT YOUR REQUEST

Favouring

Oil and Gas Regulatory Authority

The Sum of:

Pakistan Rupee Seven Hundred Fifty thousand only

PKR :*****750,000.00

Funding Account

07867000859117

KE House, 388 Sunset Boulevard, D.H.A. Phase 2 Phase 2 Ext
Defence Housing Authority Karachi Karachi City Sindh 75500

Delivery Instruction :

Reference # 2L 05181

THIS IS A SYSTEM GENERATED CHECK AND DOES NOT REQUIRE A SIGNATURE



51-289

Ref No. PLL/KE-OGRA/2020/08/26-001
August 26, 2020

The Registrar,
Oil and Gas Regulatory Authority
54-B, Fazal-e-Haq Road, Blue Area,
ISLAMABAD

K-ELECTRIC LIMITED (KEL) - APPLICATION FOR GRANT OF LICENCE FOR CONSTRUCTION AND OPERATION OF A TRANSMISSION PIPELINE (2 KM, 14" FROM CTS TO KE FACILITY)

Dear Sir,

This is with reference to your letter no. OGRA-6(1)-KE/2020 dated August 24, 2020, regarding the captioned subject. PLL's comments are given hereunder:

- PLL is currently supplying RLNG volumes from the 2nd LNG terminal to SNGPL, in accordance with the directions of the Ministry of Energy (Petroleum Division).
- The average utilization of 2nd LNG terminal has remained below 60% based upon demand communicated by SNGPL. Commencement of supplies to K-Electric will contribute towards enhancement of terminal utilization and lower terminal tariff.
- Supplies to K-Electric of 150 MMCFD will be made in line with CCOE decision dated March 27, 2020.
- After commencement of supplies to K-Electric, the volumes available for supply to other customers including SNGPL will be reduced. It is however highlighted that PLL is under no legal obligation to supply entire RLNG volumes from the 2nd LNG terminal to SNGPL.

We hope that the above information is of assistance to OGRA.

Sincerely,
For and on behalf of Pakistan LNG Limited

M. Yousaf Inam
24-Aug-2020
M. YOUSAF INAM
Assistant Manager (Sales & Marketing)
for Managing Director



*800 (LWS)
600 (LWS)*

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Ref No. PLL/KE-OGRA/2020/07/16-001
16 July 2020

The Registrar,
Oil and Gas Regulatory Authority
54-B, Fazal-e-Haq Road, Blue Area,
ISLAMABAD

KE file

SUPPLY OF RLNG TO K-ELECTRIC LIMITED

Dear Sir,

We, Pakistan LNG Limited ("PLL"), write in relation to K-Electric's ("KE") application dated 18 May 2020 for license for construction and operation of the Transmission Pipeline ("Application") for the purposes of its 900 MW BQPS III power plant currently under construction at Bin Qasim, Karachi.

We confirm that PLL and KE are currently negotiating an agreement for the sale and purchase of re-gasified LNG (RLNG) ("GSA"), which is expected to be finalized in due course. The parties will execute the GSA after obtaining all necessary approvals.

With respect to the above, and in line with CCOE decision dated 27 March 2020 (enclosed), PLL hereby confirms its intention to supply 150 MMCFD RLNG on a firm / take-or-pay basis to KE in accordance with the terms and conditions of the GSA. Additionally, the GSA will make provision for the supply of additional RLNG volumes on an as and when available basis and on mutually agreed terms.

Accordingly, we request the Authority to process KE's Application in accordance with the applicable rules at the earliest in order to enable the parties to proceed in the matter.

This letter is being issued on KE's request.

Your support in this matter will be appreciated.

Sincerely,
For and on behalf of Pakistan LNG Limited


16 Jul 2020
M. YOUSAF INAM
Assistant Manager (Sales & Marketing)
for Managing Director



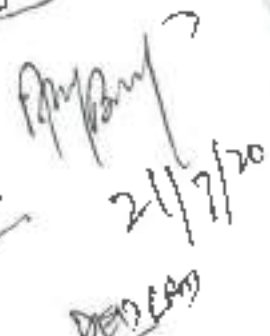
Copy to:

- Mr. Aamir Rizwan, Director Business Development, K-Electric


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ED/CLM


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DEN/CLM

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KES POWER LIMITED.

Registered Address: Floor 4, Willow House,
Cricket Square, Grand Cayman
Cayman Islands

Company Secretary

26th July, 2020

K-Electric Limited

39-B, Sunset Boulevard, Phase-II, DHA

Karachi, Pakistan

Dear Rizwan,

We can confirm that there is no requirement under applicable laws of the Cayman Islands for KES Power Limited to file annual financial returns or statements.

Further there is no requirement for KES Power Limited to procure a "Certificate of Commencement of Business."

For and on behalf of KES Power Limited:

Mikail Malik

Company Secretary

Mikail Malik
Company Secretary
KES Power Ltd.
Regd. Add: Floor 4, Willow House, Cricket Square,
Grand Cayman KY1-9010, Cayman Islands

TRUE COPY

28 SEP 2020

JUNAID TALAT WAHEED KHAN
General Manager
Corporate Affairs
K-ELECTRIC LIMITED

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Campbells

Campbells
Floor 4, Willow House, Circular Square
Grand Cayman KY1-9010
Cayman Islands

D +1 345 325 5845
T +1 345 940 2648
F +1 345 940 8613
E dimagee@campbellstlegal.com

campbellstlegal.com

Our Ref: DPM/ey/12R06-30497
Your Ref.

CAYMAN | BVI | HONG KONG

By FedEx

K-Electric Limited
2nd Floor, LDC Building, KE House
39-B, Sunset Boulevard, OHA Phase II,
Karachi, Pakistan

Attn: Rizwan Dalia, Company Secretary

24 September 2020

Dear Mr Dalia

KES POWER LTD. (the "Company")

At the request of Makail Malik, we enclose herewith notarised Letter of Confirmation, dated 22 September 2020, in connection with the above noted Company.

We would be grateful if you could acknowledge safe receipt of the enclosure by email to lflores@campbellstlegal.com.

Thank you for your attention to the foregoing.

Yours sincerely

Damiel Magee
Senior Associate

Enci

TRUE COPY

28 SEP 2020

JUNAID TALAT WAJED KHAN
General Manager
Corporate Affairs
K-ELECTRIC LIMITED

Handwritten initials and date: 29/9

The Chief Executive Officer
K-Electric

Campbells
Floor 4, Willow House, Cricket Square
Grand Cayman KY1-9010
Cayman Islands

T +1 345 949 2648
D +1 345 914 5845
E dmagee@campbellslegal.com

campbellslegal.com

Our Ref: LF/DPM/12806-30437
Your Ref:

CAYMAN | BVI | HONG KONG

22 September 2020

TO WHOM IT MAY CONCERN
RE: CONFIRMATION OF REGISTERED OFFICE – KES POWER LTD. (the "Company")

We refer to the Company, an exempted company incorporated under the laws of the Cayman Islands. This letter serves as confirmation that Campbells Corporate Services Limited acts as the registered office of the Company.

Based upon the information provided to us to us, as registered office, we confirm that there is no requirement for the Company to file any financial statement with the Registrar of Companies in the Cayman Islands. Further, we confirm that there is no requirement under applicable Cayman Islands laws for the Company to obtain or procure a "Certificate of Commencement of Business", or equivalent, before it can commence trading.

Should you require any further information with regards to the above, please do not hesitate to contact Katherine Powell-Francis (KPowell-Francis@campbellslegal.com) or Damien Magee (dmagee@campbellslegal.com) of this office.

Sincerely



Katherine Powell-Francis
authorised signatory of
CAMPBELLS CORPORATE SERVICES LIMITED

Handwritten signature of Joshua Zimmer
Joshua Zimmer
Notary Public in the Cayman Islands
Floor 4, Willow House, Cricket Square
Grand Cayman KY1-9010
Cayman Islands
My Commission expires 31 January, 2021
Tel: +1 345 949 2648
Fax: +1 345 949 8613
Date: 22 September 2020

TRUE COPY

28 SEP 2020

JUNAID TALAAT WAHEED IQBAL
General Manager
Corporate Affairs
K-ELECTRIC LIMITED



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Heads of Agreement

Heads of Agreement

1.1 Instructions

The Parties (as defined below) are in the process of entering into a Gas Sales Agreement ("GSA"). As such, the Parties wish to first enter into this Heads of Agreement ("HOA") to set out their common intentions and agree on key terms on the basis of which the Parties shall finalize and execute the GSA at the earliest.

Capitalised terms which are not defined in the text below will be defined in the execution version of the GSA.

1.2 Heads of Agreement

Article:	Term:	Provisions:
1)	Parties	<p>Seller: Pakistan LNG Limited, together with its successors and permitted assigns ("Seller").</p> <p>Buyer: K-Electric Limited, or any affiliate nominated by K-Electric ("Buyer").</p> <p>Each of the Seller and the Buyer are individually referred to as "Party" or collectively as "Parties".</p>
2)	Purpose/Supply of RLNG	<p>The Seller agrees to procure, ship and regasify liquefied natural gas ("LNG") and transport and deliver regasified LNG ("RLNG") to the Buyer at the Delivery Point, and the Buyer agrees to purchase, receive and pay for RLNG in accordance with the terms of the HOA and the terms of the GSA to be agreed and entered into between the Buyer and Seller based on the terms of this HOA in relation to the sale and purchase of RLNG.</p> <p>The RLNG shall be solely utilized by the Buyer as fuel for power generation at the Buyer's Bin Qasim Power Station ("BQPS") complex.</p>
3)	Seller's Facilities	<p>"Seller's Facilities" means the FSRU, jetty and topsides, Send-out Pipeline to the Custody Transfer Station, Seller's Metering, and such other facilities, equipment and machinery upstream of the Delivery Point as are required for the Seller to deliver and make available for delivery quantities of RLNG at the Delivery Point, which facilities shall be more fully described in the GSA.</p> <p>The Seller's Facilities shall have the capability to deliver RLNG to the Delivery Point as per the requirements of the HOA and the GSA.</p>
4)	Buyer's Facilities	<p>After the Delivery Point, the Buyer shall construct and operate gas infrastructure, and such other facilities, equipment and machinery downstream of the Delivery Point to allow the Buyer to receive delivery quantities of RLNG from the Delivery Point, which facilities shall be more fully described in the GSA (the "Buyer's Facilities").</p>


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MUMTAZ KHAN DALLA
Company Secretary
K-ELECTRIC LIMITED




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Heads of Agreement

Article:	Term:	Provisions:
		<p>The Buyer and the Seller agree to complete their respective Facilities within the timelines envisaged under this HOA and the GSA to ensure the supply of RLNG by the Commissioning Start Date.</p> <p>The Parties agree and acknowledge that the readiness of the Buyer's Facilities and Seller's Facilities are independent obligations of the Parties. Accordingly, a Party shall not delay the completion of its Facilities based on any delay in the completion of the other Party's Facilities.</p>
5)	Conditions Precedent	<p>The obligations of the Parties under the GSA, unless otherwise specified in the GSA, shall be, inter alia, conditional upon:</p> <ul style="list-style-type: none"> (i) the Seller providing the Buyer duly executed copies of material contracts i.e. any contracts executed by and between the Seller and such other third parties to ensure regasification, transportation and uninterrupted supply of RLNG to the Buyer; and (ii) the receipt of regulatory approvals by the Parties, as per the requirements of the laws of Pakistan, including in relation to the purchase, storage, regasification and transportation of RLNG and generation of electricity, from the relevant regulatory authority.
6)	RLNG Delivery Point	<p>The "Delivery Point" shall be situated at the Custody Transfer Station or at any other point which is mutually agreed between the Parties.</p>
7)	Title and Custody Transfer	<p>The title, custody and risk of loss for any RLNG deliveries shall remain with the Seller up to the Delivery Point and will pass from the Seller to the Buyer at the Delivery Point.</p>
8)	Commissioning of BQPS-3 Unit One and BQPS-3 Unit Two	<p>The BQPS-3 power plant will consist of two units, BQPS-3 Unit One and BQPS-3 Unit Two.</p> <p>Each of BQPS-3 Unit One and BQPS-3 Unit Two will undergo commissioning within a period (currently expected to be up to 60 days in each case) prior to each declared commercial operation date (each a "Commissioning Period").</p> <p>For each of BQPS-3 Unit One and BQPS-3 Unit Two, a windowing process will be discussed in the GSA for the start of the Commissioning Period(s), i.e. the Commissioning Start Date. The Buyer shall inform the Seller of the commencement date for the Commissioning Period in relation to BQPS-3 Unit One and BQPS-3 Unit Two (each a "Commissioning Start Date") by giving notice to the Seller thereof at least one hundred and twenty (120) days prior to such date. The Buyer shall have the right to revise such Commissioning Start Date by giving a notice at least ninety (90) days prior to the Commissioning Start Date.</p>


MUHAMMAD FIRDAUS DURRANI
 Company Secretary
 K-ELECTRIC LIMITED



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Heads of Agreement

Article	Term	Provisions:
		<p>initially notified by the Buyer, provided that the revised Commissioning Start Date shall be no later than sixty days from the Commissioning Start Date initially notified by the Buyer. Provided further that such right to revise the Commissioning Start Date shall be available to the Buyer only once.</p> <p>The Seller shall deliver RLNG in such quantities as notified by the Buyer for the Commissioning Period. The Buyer shall communicate to the Seller its requirement at least one hundred and twenty (120) days prior to the start of respective Commissioning Period, (the "Commissioning RLNG") such that during the Commissioning Period, the Commissioning RLNG estimated for the first 30 days of the Commissioning Period shall be on an as required basis, with room for adjustment for daily denominations of RLNG required by the Buyer (provided that the Buyer provides the Seller with a firm estimate of the total RLNG that it requires for the said first 30 days of the Commissioning Period), whereas the Commissioning RLNG for the latter 30 days of the Commissioning Period shall be on firm basis without any adjustment for daily denominations. The Commissioning RLNG shall be purchased at the RLNG Contract Price.</p> <p>Buyer shall be under no obligation to accept delivery of Commissioning RLNG that does not meet the Specifications.</p> <p>Commissioning RLNG is in addition to and will not form part of the Firm Gas Allocation.</p>
9)	<p>Start Date of BQPS-3 Unit One and Start Date of BQPS-3 Unit Two</p>	<p>The Start Date of BQPS-3 Unit One shall be the commercial operation date for BQPS-3 Unit One as notified by the Buyer to the Seller, which date shall be no later than sixty (60) days from the Commissioning Start Date for BQPS-3 Unit One.</p> <p>The Start Date of BQPS-3 Unit Two shall be the commercial operation date for BQPS-3 Unit Two as notified by the Buyer to the Seller, which date shall be no later than sixty (60) days from the Commissioning Start Date for BQPS-3 Unit Two.</p> <p>The Seller shall deliver and the Buyer shall off-take RLNG in the quantities as per the Firm Gas Allocation after the Start Date for BQPS-3 Unit One and after the Start Date for BQPS-3 Unit Two.</p> <p>Without prejudice to the foregoing, and subject to such confirmation in the GSA:</p> <ul style="list-style-type: none"> (i) the Start Date of BQPS-3 Unit One is currently expected to be in May 2021; and (ii) the Start Date of BQPS-3 Unit Two is currently expected to be in November 2021.

[Handwritten signature]

SHARAD KUMAR DALIA
 Company Secretary
K-ELECTRIC LIMITED

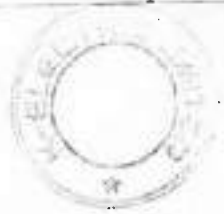
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Heads of Agreement

Article:	Terms:	Provisions:
10)	Longstop Date & Term of HOA	<p>Unless otherwise extended by the mutual agreement of the Parties, this HOA shall remain in force until 31 December 2020 i.e. the "Longstop Date" or the signing of the GSA, whichever is earlier.</p> <p>In case the GSA is not signed by the Longstop Date, this HOA shall terminate without any additional liabilities on either Party.</p>
11)	Initial Term of the GSA	<p>The initial term of the GSA shall be from the signing of the GSA till the end of December 2025 (the "Initial Term").</p> <p>For the purposes of the delivery of the Firm Gas Allocation, "Contract Year" means, for the first Contract Year, the period starting from the Start Date of the BQPS Unit 1 till December 31 of that year and, for each subsequent Contract Year, a period of twelve (12) consecutive months therefrom.</p> <p>The Seller and the Buyer may mutually agree in writing to extend the term of the GSA ("Extension of Initial Term of GSA").</p>
12)	Source of RLNG	<p>RLNG shall be supplied from the Seller's Facilities. The Seller shall, at its sole discretion, procure LNG from any sources, so long as the RLNG supplied at the Delivery Point from Seller's Facilities meets the requirements of the GSA.</p>
13)	Firm Gas Allocation and Take or Pay	<p>From and after the Start Date of the BQPS-3 Unit 1 (including the firm supply period after Commissioning Start Date) and during each Billing Cycle in a Contract Year, the Buyer shall take and if not taken, pay for the portion of the total quantity of RLNG to be delivered by the Seller to the Buyer, on firm basis, in terms of the Annual Delivery Plan and Additional Firm Gas Order (the "Firm Gas Allocation") pertaining to that Billing Cycle, which quantity shall be adjusted, as shall be detailed in the GSA, to reflect quantities that the Seller may sell to third parties in the event of an unexcused failure of the Buyer to take the delivery of the designated Billing Cycle Take or Pay Quantity as provided in the Firm Gas Allocation (the "Billing Cycle Take-or-Pay Quantity") divided by the number of days in that Billing Cycle multiplied by the difference between the number of days in that Billing Cycle and (i) the number of days (or fractions thereof) of Force Majeure Events declared by the Seller or the Buyer, (ii) the number of days (or fractions thereof) of non-delivery of RLNG by the Seller in that Billing Cycle for any reason, including a breach or default by the Seller or maintenance undertaken by the Seller, (iii) the number of days (or fractions thereof) of non-delivery of RLNG because of Off-Specification RLNG, and (iv) the number of days of scheduled outages in that Billing Cycle notified to the Seller (in relation to the maintenance and scheduled outages, as per the terms of the GSA, each to the extent not already catered for under the Firm Gas Order).</p> <p>Unexcused failures in relation to supply and off-take of RLNG in relation to the respective Party shall be defined in the GSA.</p>

 
SHARIFUDDIN BIN MOHAMMAD
 Company Secretary
 K-ELECTRIC LIMITED



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Heads of Agreement

Articles:	Terms:	Provisions:
		<p>The Buyer shall pay for the RLNG which it does not off-take as per the aforementioned criteria. Provided that up to two days equivalent supply of the RLNG not off-taken in any given month in a Contract Year (at the average MMCFD for the said month) shall be supplied to the Buyer as make-up gas at the RLNG Contract Price applicable for the period during which the said volumes of make-up RLNG are actually supplied (subject to adjustment on account of price differential in relation to such make-up gas which shall be payable, as applicable, at the time such make-up gas is supplied), as per the make-up gas provisions to be agreed in the GSA. The make-up gas provisions in the GSA shall set out a ninety (90) day period (as may be extended by mutual agreement between the Parties) within which such volumes of RLNG shall be delivered by the Seller to the Buyer as make-up gas. The delivery of such make-up gas will be scheduled on the days when the Buyer requires the same and the Seller has sufficient storage and regasification capacity to cater to the Buyer's requirement for such make-up gas. If the Seller fails to offer delivery of such make-up RLNG within the 90-day period, the Buyer shall be entitled to a refund to the extent of the RLNG Contract Price for the make-up RLNG not delivered. If the Seller offers the make-up RLNG within the 90-day period but the Buyer fails to off-take the same, the Net Proceeds mechanism shall apply to the RLNG not off-taken by the Buyer. Any RLNG exceeding the two days equivalent of RLNG supply which is not off-taken by the Buyer shall be subject to the Net Proceeds mechanism set out below.</p> <p>The Parties agree that in the event of an unexcused failure of the Buyer to take the delivery of the designated Billing Cycle Take or Pay Quantity as provided in the Firm Gas Allocation, which triggers the Buyer's Take or Pay obligations, then the Seller may, at its discretion, sell such RLNG to a third Party and refund such sale proceeds after deduction of its selling costs to the Buyer (the "Net Proceeds"). In case the Seller does not or cannot sell the whole or part of the Billing Cycle Take or Pay Quantity to a third party purchaser, the Buyer will be required to pay for the Billing Cycle Take or Pay Quantity at the RLNG Contract Price.</p> <p>The Buyer shall be entitled to a reduction in the quantity of RLNG to be delivered as per the Annual Delivery Plan by giving a one hundred and twenty (120) days prior notice to the Seller. However, in any case, such reduced quantities shall not fall below the Minimum Gas Order for a Contract Year.</p> <p>For the purposes of the Firm Gas Allocation:</p> <p>"Annual Delivery Plan" means the annual plan for deliveries of RLNG to the Buyer up to the Maximum Gas Allocation but not less than the Minimum Gas Order as agreed one hundred and twenty (120) days prior to the start of each Contract Year by the Parties (broken-down into weekly delivery schedules). The Annual Delivery Plan shall also</p>

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BHAVARD KHANDALE
Company Secretary
M-REGISTRATION



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Heads of Agreement

Article:	Terms:	Provisions:
		<p>address variations in the Buyer's requirements during the summer and winter months. Provided that, the Buyer may reduce the quantities as provided in the Annual Delivery Plan by giving a one hundred and twenty (120) days' notice to the Seller, provided such reduced quantities shall not fall below the Minimum Gas Order for a Contract Year. Such reduction shall not result in the deliveries of RLNG in a Contract Year to fall below the Minimum Gas Order.</p> <p>"Additional Firm Gas Order" means any order placed by the Buyer and, as agreed by the Seller, for delivery of any additional RLNG, one hundred and twenty (120) days prior to the date on which the Buyer requires the same (broken-down into weekly delivery schedules).</p> <p>"Minimum Gas Order" means, for any Contract Year, aggregate 75% of the Maximum Gas Allocation applicable for the relevant period.</p> <p>"Maximum Gas Allocation" - The amount of RLNG required by the Buyer during a Contract Year which shall be an amount of 150 MMSCFD.</p> <p>In case the Buyer requires RLNG over and above the Firm Gas Allocation in any Contract Year or if the Buyer requires RLNG for which a prior one hundred and twenty (120) day notice to the Seller cannot be given, the Buyer may request such quantities from the Seller, which shall use reasonable efforts, to supply such RLNG to the Buyer at the RLNG Contract Price. However, the delivery of such additional quantities shall be subject to the Seller's agreement and the finalization of terms and conditions in relation to such delivery.</p>
14)	RLNG Contract Price	<p>The price to be charged by the Seller to the Buyer under the GSA in relation to the quantities of RLNG supplied will be the OGRA determined price applicable to RLNG supply at Delivery Point, plus any additional taxes that may be applicable for the sale of RLNG in Pakistan ("RLNG Contract Price").</p>
15)	Failure to Supply	<p>If the Seller fails to supply RLNG equal to the scheduled delivery quantity as set out in the Annual Delivery Plan or Additional Firm Gas Order or fails to supply RLNG that meets the Specifications in [Exhibit J] of this HOA ("Off-Specification RLNG") during the Term:</p> <p>(i) The Seller shall use its best endeavours to secure a replacement supply of RLNG or Gas conforming to the RLNG Quality at the Delivery Point, at no additional cost to the Buyer to cover the shortfall on the relevant day; and</p> <p>(ii) In the event of an unexcused failure to supply:</p> <p>(a) by the Seller for reasons solely attributable to the Seller, resulting in Seller's inability to provide such RLNG or Gas at the Delivery Point,</p>



 MUHAMMAD RIZWAN DATTA

 Company Secretary

 K-ELECTRIC LIMITED



Heads of Agreement

Article:	Terms:	Provisions:
		<p>the Seller shall reimburse the Buyer the differential price for (x) the alternate fuel/RLNG (provided that such alternate fuel/RLNG has been used for generation and the Buyer provides documented evidence to the Seller to this effect); or (y) the plant after the BQPS-3 in the economic merit order (to be defined in the GSA) as despatched by the Buyer to make up for the power shortage caused by such failure to supply and the Buyer provides verifiable/documentated evidence to the Seller to this effect, provided that the alternate fuel/RLNG used for generation by the Buyer is the most cost-effective viable alternate fuel;</p> <p>(b) by the Seller, for reasons attributable to the LNG supplier, resulting in Seller's inability to provide such RLNG or Gas at the Delivery Point, the Seller shall reimburse the Buyer, subject to (i) below, for an amount not exceeding 30% of the cargo value of the LNG supplier; or</p> <p>(c) by the Seller, for reasons attributable to the Terminal Operator, the Seller shall reimburse the Buyer, subject to (ii) below, for an amount not exceeding the recourse available to the Seller under the Terminal Use and Regasification Agreement.</p> <p>The Buyer hereby agrees that:</p> <p>(i) In the event of any failure by any LNG supplier to deliver LNG to the Seller, or rejection by the Seller of off-specification LNG tendered for delivery, the Seller shall first be entitled to lodge a claim against such LNG supplier and pursue the same. The amount recovered by the Seller shall be payable to the Buyer, after adjustment of any applicable taxes and costs incurred during recovery of relevant amount; or</p> <p>(ii) In the event that the Seller is unable to supply RLNG due to the failure of the terminal operator, the Seller shall first be entitled to lodge a claim against such terminal operator and pursue the same. The amount recovered by the Seller shall be payable to the Buyer after adjustment of any applicable taxes and all costs incurred during recovery of relevant amount, in proportion to the relevant rights or losses suffered by the LNG supplier(s) and the Buyer.</p> <p>In such event of an unexcused failure to supply, the Seller shall promptly inform in writing to the Buyer explaining the reasons for such failure along with the name of the party responsible.</p> <p>The Seller shall be excused from these obligations in the event of:</p> <p>(a) Force Majeure affecting the Seller (including the Seller's LNG suppliers' facilities or the Seller's Facilities etc.); or</p> <p>(b) failure of Buyer to take delivery of RLNG (which is not Off-Specification RLNG).</p>

[Signature]
WONG HING HOON DALE
 Company Secretary
 H-ELECTRIC LIMITED



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Heads of Agreement

Article:	Term:	Provisions:
		(c) Adverse Weather Conditions (as defined in the Seller's LNG Sale and Purchase Agreement) affecting LNG vessels to berth at the terminal.
16)	Nominations and Delivery Procedures	<p>Nominations and delivery procedures shall be specified in the GSA on the basis of customary practice in the natural gas industry.</p> <p>The Annual Delivery Plan shall set out the weekly nominations of RLNG. Such weekly nominations shall be further specified as daily nominations five days prior to the start of each month.</p> <p>The Parties agree to set out the details of the treatment of scheduled and forced outages of the Buyer's Facilities and the Seller's Facilities in the GSA.</p>
17)	Quality	<p>RLNG supplied by the Seller at the Delivery Point shall conform to the Specifications in [Exhibit 1] of this HOA ("RLNG Quality").</p> <p>The Buyer, at its option, may refuse to accept delivery of any Off-Specification RLNG and shall give prompt notice to the Seller of such refusal. The Seller shall take immediate remedial action to cause the Off-Specification RLNG to conform to the Specifications and until such time that such Off-Specification RLNG conforms to the Specifications, such Off-Specification RLNG, if off-taken, shall be deemed to have been accepted. However, if such Off-Specification RLNG is not off-taken, it shall be considered to have been not delivered by the Seller.</p> <p>The GSA shall set out the consequences for the delivery of Off-Specification RLNG and the Seller's liabilities in relation to Off-Specification RLNG.</p>
18)	Security Requirements Buyer	<p>The Buyer shall provide security for its payment obligations in the form of (i) an Irrevocable and Unconditional Standby Letter of Credit in Pakistani Rupees, equal to the supply of 40 days of RLNG (at 75 MMCFD), in a form acceptable to the Seller which shall have validity for a period of one year and shall be renewed for each Contract Year before its expiry, during the Initial Term; and (ii) an Irrevocable and Unconditional Standby Letter of Credit in Pakistani Rupees, equal to the supply of 40 days of RLNG (at 75 MMCFD) which shall be valid for the [peak period] specified in the Annual Delivery Plan for each Contract Year (each an "SBLC"). The particulars with respect to the terms of renewal and all consequential terms of the SBLC shall be agreed between the Parties in the GSA. Buyer to keep such security in full force and effect during the term of the GSA and any further extensions.</p> <p>The SBLC amount shall be subject to revision every ninety days in a Contract Year, if there is a 10% or more change in the RLNG Contract Price, whether such change is upwards or downwards, on account of change in the exchange rate or any price revision/adjustment by the competent authority.</p>

[Handwritten Signature]

 MUHAMMAD KUTUBULLAH
 Company Secretary
 M-ELECTRIC LIMITED



[Handwritten Signature]

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Heads of Agreement

Articles	Terms:	Provisions:
		<p>The Seller shall communicate any revisions required in the SBLC amount as above and the Buyer shall ensure that the SBLC is revised accordingly within seven (7) business days from the Seller's communication.</p> <p>Further, in case of any drawdown, the SBLC to be replenished within seven (7) business days of the said drawdown.</p> <p>The Buyer shall provide separate sufficient security in a form to be agreed in the GSA in relation to the RLNG volumes over and above the Maximum Gas Allocation as requested by the Buyer.</p> <p>If the Buyer fails to pay in full any invoice within the due date of the relevant invoice, the Seller shall, in addition to other rights and remedies, have the right to immediately issue a demand under the SBLC for the unpaid amount.</p>
19)	Security Requirements Seller	<p>The Seller shall, subject to inclusion of SBLC cost by OGRA in the RLNG Contract Price or directions received from competent authorities, provide security for its obligations in the form of an Irrevocable and Unconditional Standby Letter of Credit in Pakistani Rupees, renewable no less frequently than annually ("Performance Security") in a form acceptable to the Buyer. The Performance Security shall be for an amount equal to the differential price for alternate fuel/RLNG required to run the Complex for five days at full capacity. The Seller shall keep such security in full force and effect during the term of the GSA and any further extensions.</p> <p>Further, in case of any drawdown, the Performance Security shall be replenished within seven business (7) days of the said drawdown. However, in case the same is not allowed by OGRA, parties shall seek guidance from the competent authorities prior to the execution of GSA.</p> <p>The Performance Security shall be returned to the Seller on the expiry of such period or earlier termination of the GSA after adjustment of amounts payable to the Buyer.</p>
20)	Billing/ Payments	<p>The Buyer shall pay to the Seller the RLNG Contract Price multiplied by the quantity of RLNG actually delivered to the Buyer at the Delivery Point, during any ten (10) day period (the "Billing Cycle"), pursuant to the RLNG orders (the "RLNG Payments"). The invoices shall also include any volumes ordered but not off-taken i.e. Take-or-Pay quantities.</p> <p>The Seller's invoices for the supply of RLNG during a Billing Cycle, including any adjustments, shall be furnished to Buyer on the first Business Day following each Billing Cycle.</p>


 MUHAMMAD AZHAR HUSSAIN
 Company Secretary
 K-ELECTRIC LIMITED



Heads of Agreement

Articles	Terms	Provisions:
		<p>The Buyer shall pay all invoices, inclusive of sales tax and other applicable duties and levies within five (5) days from the day of issuance of the invoice.</p> <p>After the invoices have been furnished and/or paid, if the Seller or the Buyer within one (1) year after posting of any invoice discovers any manifest error, omissions or discrepancies in any such bills due to any reason whatsoever, the Seller or the Buyer shall bring such discrepancies to the notice of the other and the Parties shall agree to adjust the bills accordingly.</p> <p>The RLNG Contract Price for all RLNG delivered under the OSA shall be the price in Pakistani Rupees or United States Dollars (USD) per MMBTU determined by the OGRA from time to time under the applicable law. If the RLNG Contract Price determined/ notified by the OGRA is in United States Dollars per MMBTU then the same shall be converted into Pakistani Rupees, by using the interbank selling exchange rate published by National Bank of Pakistan on the date of issuance of the invoice. Any exchange loss/gain due to difference in exchange rate between the date of issuance of the invoice and date of payment by the Seller to its suppliers will be claimed by the Seller and payable by the Buyer, provided that the same has been determined by OGRA and passed on through the RLNG Contract Price.</p> <p>In case the Buyer fails to pay the undisputed amount set out in the invoice, the Seller shall in addition to its other rights and remedies, be entitled to make drawdown on the SBLC equivalent to the amount shown in the invoice and subsequently suspend the supply of RLNG, at the risk and cost of the Buyer, by giving two (2) business days written notice of suspension to the Buyer, provided that such right of suspension shall only be exercised in the event that the Buyer fails to replenish the balance amount remaining in the SBLC following any drawdown(s) in terms of the clause 18 of this HoA; provided further that the Seller shall not suspend the supply of RLNG if the requested amount is paid within two (2) business days, and provided further that if the Seller suspends the supply of RLNG, the Seller shall resume the supply of RLNG within twenty four (24) hours of receiving payment of such unpaid amount, plus the Seller's reconnection costs.</p> <p>In case of any delay in payments by the Buyer, a late payment surcharge (LPS) will be applicable at the rate of one-month KJBOR plus 2% on the overdue principal amount(s).</p> <p><i>[Tariff Differential Claim (TDC)]</i></p>




MUHAMMAD ROSHAN DATTA
 Company Secretary
 K-ELECTRIC LIMITED




Heads of Agreement

Article:	Term:	Provisions:
		<p>Note: Buyer's stance is that net-off mechanism with TDC receivable shall be followed under which late payment surcharge shall only be levied on delayed payment after netting off the TDC. On the other hand, the Seller cannot agree with such provisions as it would affect its onward payment obligations to international LNG suppliers. Accordingly, Parties agree that there is a need for seeking guidance/approval from CCoE, or any other competent authority, before finalization of the GSA, to address any delay in adjustment of TDC by GoP.]</p> <p>The Seller shall pay to the Buyer the Net Proceeds within five days of the receipt of such Net Proceeds.</p> <p>Invoices relating to damages payable by the Seller to the Buyer, shall be furnished to Seller on the first Business Day following each Billing Cycle. The Seller shall pay such damages within fourteen (14) days from the day of issuance of the invoice.</p> <p>The GSA shall provide for detailed invoicing and payment mechanics.</p>
21)	Suspension of Performance	<p>The Seller shall have the right to suspend the supply of RLNG, at the risk and cost of the Buyer, by giving two (2) business days written notice of suspension to the Buyer if the SBLC has not been adjusted or replenished in terms of clause 18 and clause 20.</p> <p>Further, in the event that the SBLC is not renewed within (30) days of its scheduled expiry then without prejudice to any other rights or remedies available to the Seller under the GSA, the Seller shall be entitled to suspend deliveries of RLNG through a prior seven (7) days written notice to the Buyer.</p> <p>The GSA will set out other instances where the delivery of RLNG may be suspended, including Force Majeure events.</p>
22)	Termination	<p>The Seller may give a notice to terminate the GSA upon the occurrence of a "Buyer Event of Default" unless resulting from a Force Majeure Event or from a breach or default by the Seller under the GSA.</p> <p>The Buyer may give a notice to terminate the GSA upon the occurrence of a "Seller Event of Default" unless resulting from a Force Majeure Event or from a breach or default by the Buyer under the GSA.</p> <p>Specific instances of Buyer Event of Default and Seller Event of Default, as are customary in the natural gas industry, shall be agreed by both Parties in the GSA. These may include, but shall not be limited to:</p> <p>(a) any assignment or transfer of rights and obligations under the GSA in violation of the terms of the GSA.</p>

 
K. S. Jeyaraj
 Company Secretary
 K-SUBETEC LIMITED

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Heads of Agreement

Article:	Term:	Provisions:
		<p>(b) the occurrence of any of the following events: (i) the passing of a resolution by the shareholders of the Party for winding up, (ii) the appointment of a provisional liquidator in case of bankruptcy adjudged by a court of competent jurisdiction, which appointment has not been set aside or stayed within ninety (90) days of such appointment, or (iii) the making of an order winding up a Party by a court of competent jurisdiction</p> <p>(c) any statement, representation or warranty made by a Party herein proving to have been incorrect, in any respect, when made or when deemed to have been made and the circumstances that cause such failure or incorrect statement, representation or warranty to be incorrect having a material adverse effect such Party's ability to perform its obligations under the GSA;</p> <p>(d) any material breach by a Party of the GSA which is not remedied within thirty (30) days after notice from the other Party, which notice (i) states that a material breach of the GSA has occurred and is continuing which could result in the termination of this GSA, (ii) identifies the breach in question in reasonable detail, and (iii) demands remedy thereof.</p> <p>the revocation, withdrawal, or cancellation of regulatory approvals and/or licences required by the Parties, under the laws of Pakistan, to fulfil its obligations under the GSA.</p>
23)	Force Majeure	<p>"Force Majeure" means any act, event or circumstance or combination of acts, events or circumstances, occurring on or after the Signing Date, that is beyond the reasonable control of a Party and which materially and adversely affects the performance by such affected Party of its obligations under or pursuant to this Agreement (including a Party's ability to deliver or receive gas at the Delivery Point). <i>[Note: such entities to be agreed and set out in the HOA and GSA (as applicable)].</i></p> <p>Details of what constitutes a Force Majeure Event (including those caused by a Pakistan political event, change of law event and other event), the consequences thereof, and the appropriate obligations for each Party to notify the other of a Force Majeure Event shall be set out in the GSA for the benefit of both Parties.</p> <p>Specific instances which shall not be a Force Majeure Event, as are customary in the natural gas sector, will also be expressly set out in the GSA.</p> <p>The affected Party shall use all reasonable efforts to mitigate the effect of a Force Majeure Event.</p>


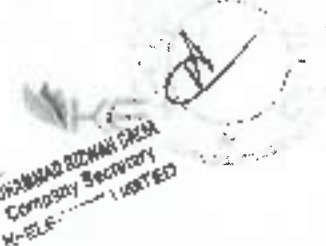

 M. Ishaq Khan
 Company Secretary
 H-ELECTRIC LIMITED




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Heads of Agreement

Article:	Term:	Provisions:
24)	Assignment	<p>Subject to applicable law and directions of the Government of Pakistan, no Party shall be entitled to assign, novate, transfer, encumber or otherwise dispose of its rights or obligations under the GSA without the prior written consent of the other Party.</p> <p>Notwithstanding the above, the Seller shall not require the consent of the Buyer in relation to any assignment, novation, transfer, encumbrance or disposal of rights and obligations under the GSA in favour of any entity owned directly or indirectly by the Government of Pakistan or following any merger of the Seller with another entity directly or indirectly owned by the Government of Pakistan. The Buyer shall enter into any novation agreement with the entity directly or indirectly owned by the Government of Pakistan in relation to such assignment on the same terms and conditions.</p> <p>Notwithstanding the above, the Buyer shall not require the consent of the Seller in relation to any assignment, novation, transfer, encumbrance or disposal of rights and obligations under the GSA by the Buyer in favour of any financing parties or their agent in connection with any financing or refinancing of BQPS-3. However, the Buyer shall provide a one (1) week prior written notice to the Seller in this regard setting out the details of the financing parties.</p>
25)	Governing Law	<p>The GSA will be governed by and construed in accordance the laws of Pakistan.</p>
26)	Dispute Resolution	<p>Parties will establish a Joint Operating Committee ("JOC") which will serve as an internal dispute resolution committee, the Committee will meet to resolve disputes or potential disputes arising between the Parties.</p> <p>Composition of JOC shall be 2 representatives from each Party who shall meet at mutually decided intervals. The role of the JOC will be further detailed the GSA.</p> <p>For all Technical Disputes, both Parties will mutually agree upon a Technical Expert who will within thirty (30) days of receipt of same provide his/ her views.</p> <p>Any and all disputes arising out of, or in connection with or the GSA, which remain unresolved for thirty (30) days after being discussed in good faith, shall be finally settled under arbitration. The applicable arbitration forum, seat and venue shall be set out in the GSA.</p> <p>In case of any disputes pertaining to the Seller's invoices:</p> <p>(i) such disputes may only be raised by the Buyer in relation to the quality and quantity of RLNG supplied by the Seller; and</p>

MUHAMMAD RIZWAN GHANI
 Company Secretary
 GHANI BROTHERS PRIVATE LIMITED




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Heads of Agreement

Article:	Term:	Provisions:
		<p>(ii) shall be resolved at the end of the month in which such invoice was issued through a joint metering activity between the Parties (which shall be vetted and verified by a third party surveyor) and the disputed amounts withheld by the Buyer, if any, shall be cleared accordingly. In case such dispute remains, the Buyer shall pay to the Seller the disputed portion of the invoice which shall be adjusted upon the resolution of the dispute through the IOC or arbitration, as the case may be. Once the dispute is resolved, the Buyer shall raise an invoice in accordance with the mechanism provided in the GSA. In case of non-payment by the Seller, the Buyer shall be entitled to set-off the amount, including any late payment surcharge, decided in its favour from the future invoices of the Seller.</p> <p>The Parties shall discuss the scope of the expert in relation to resolution of certain disputes and incorporate the provisions in the GSA.</p>
27)	Liabilities	<p>The Parties shall insert appropriate limitations on liabilities and indemnity provisions in the GSA as are customary in the natural gas sector. The GSA shall, inter alia, provide that neither Party shall be liable to the other for any loss of profit, loss of opportunities, loss of use, loss of production, loss of contracts or for any other financial or economic loss whatsoever nor for any indirect or consequential damage that the other may suffer, provided that the relevant clause of the GSA relating to liabilities shall not operate to restrict any losses incurred by a Party resulting from any fraud, intentional or wilful misconduct, negligence, or illegal or unlawful acts or omissions of a Party.</p>
28)	Representations and Warranties	<p>To be negotiated in the GSA, and mutually agreed on the basis of customary practice in the natural gas industry. However, the representations and warranties of the Parties shall, inter alia, include the following:</p> <p>(i) each of the Parties represents and warrants that it has the right, power and authority to enter into and perform its obligations under the GSA, and it has taken all necessary corporate or other action to authorise the execution of, and performance by it of its obligations, under the GSA, and the GSA constitutes valid, binding and enforceable obligations of the Seller or the Buyer as the case may be;</p> <p>(ii) each of the Parties represents and warrants that it has not entered, and shall not enter, into any contracts or arrangements which are contradictory to or in conflict with the terms of the GSA;</p> <p>(iii) each of the Parties represents and warrants that:</p> <p>(a) it will comply with all applicable laws governing or relating to its performance under the GSA;</p> <p>(b) it will act in a reasonable and prudent manner in relation to their respective obligations under the GSA; and</p> <p>(c) it will maintain its corporate authority to perform its obligations under the GSA;</p>

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KE
RICHARDO RIZMAN DALA
Company Secretary
PT. PETROBRAS



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30/1/18

Heads of Agreement

Articles:	Terms:	Provisions:
		<p>(d) it will obtain and maintain all approvals and/or licences required by such Party, under the laws of Pakistan, to fulfil its obligations under this GSA.</p> <p>(iv) the Seller represents and warrants to the Buyer that it shall ensure that RLNG is delivered to the Buyer with clean title and free of all encumbrances and adverse claims.</p> <p><i>[The Representations and Warranties will be further detailed in the HOA or the GSA]</i></p>
29)	Confidentiality	<p>The Parties shall treat the contents of the HOA and the GSA and all negotiations arising as strictly confidential ("Confidential Information"). The Parties will not disclose any Confidential Information without the prior written consent of the other Party except for disclosure by a Party to its employees, affiliates, shareholders, lenders or professional advisors, as expressly set out in the GSA, or to any regulatory authority in Pakistan including NEPRA, or where disclosure is required by law, courts of law, rules of a relevant stock exchange or by any governmental authority to the extent necessary to comply with any proper commercial, governmental or legal requirement for the purposes of the HOA or the GSA.</p>
30)	Measurements	<p>The Parties shall set out the provisions in relation to measurement of the volume, thermal value, temperature, pressure, and composition of the natural gas delivered to Buyer at the Delivery Point, according to the standards and procedures to be agreed in the GSA and as per the existing measurement mechanisms applied at the LNG terminal 2.</p> <p>Any dispute between the Parties with respect Measurements shall be subject to the Dispute Resolution provisions under the GSA.</p> <p>The procedures for reading and calibration of metering system shall be set out in detail in the GSA.</p>
31)	Insurance	<p>To be discussed and agreed between the Parties prior to execution of GSA on the basis of customary practice in the natural gas industry.</p>
32)	Notices	<p>To be discussed and agreed between the Parties prior to execution of GSA on the basis of customary practice in the natural gas industry.</p>
33)	Business Practices	<p>The Parties shall include relevant warranties and covenants in the GSA with regard to business practices as is customary.</p>
34)	Other Obligations	<p>Each party shall be required to maintain all consents, approvals and licenses required for performance of its obligations under the GSA.</p> <p>Provisions relating to wilful misconduct will be set out in the GSA.</p>
35)	Taxes	<p>The RLNG Contract Price shall include all taxes applicable, including any GST, on the sale of RLNG in Pakistan.</p> <p>The GSA will provide that the Seller will be responsible for or procure the payment of all taxes arising from its corporate existence or profits.</p>


 MUHAMMAD FARHAN DURRANI
 Company Secretary
 K-ELCCT




Heads of Agreement

Articles:	Terms:	Provisions:
		<p>The GSA will provide that the Buyer will be responsible for all taxes arising from its corporate existence or profits.</p> <p>All payment, withholding, deposit, and filing requirements under law and regulations shall be applicable to each Party.</p>
36)	Lenders	<p>The Seller shall extend all reasonable cooperation to Buyer to assist the Buyer in obtaining financing for BQPS-3 Unit One and BQPS-3 Unit Two, including entering into a direct agreement (in a form acceptable to the Seller) customary for project financings (including provisions relating to step-in, step-out and assignment rights, rights to appoint a receiver, and such additional reasonable provisions that the Lenders may request in connection therewith).</p> <p>Similarly, the Buyer shall extend all reasonable cooperation to the Seller to assist the Seller in obtaining any financing facilities in relation to the Seller's obligations under the GSA.</p>

PAKISTAN LNG LIMITED

By: *Masood Nabi*
 Name: **MASOOD NABI**
 Title: **MD/CEO**

Witnessed by:
 1. *Yaswan M. Ghazi*
 Name: **Yaswan M. Ghazi**
 Title: **M.A. Procurement**

2. *M. Yousef Inam*
 Name: **M. Yousef Inam**
 Title: **AM (Sales & Marketing)**

K-ELECTRIC LIMITED

By: *Syed Noonis Abdullah Alvi*
 Name: **SYED NOONIS ABDULLAH ALVI**
 Title: **CHIEF EXECUTIVE OFFICER**

Witnessed by:
 1. *Muhammad Amir Ghaziani*
 Name: **MUHAMMAD AMIR GHAZIANI**
 Title: **CFO**

2. *Amir Rizwan Qureshi*
 Name: **AMIR RIZWAN QURESHI**
 Title: **DIRECTOR BUSINESS DEVELOPMENT**

KE

 Masood Nabi
 Company Secretary
 K-ELECTRIC LIMITED



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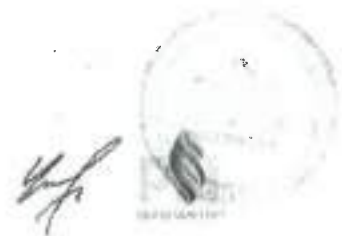
Heads of Agreement

Annex-I – RLNG Specifications

Sr.	Characteristics	Unit of Measurement	Limits
1	Gross Calorific Value	BTU/SCF	947.6 to 1140
2	Methane (C ₁)	%	Min. 85%
3	Wobbe Index	BTU/SCF	1292 to 1435
4	Inert Gases, Total	% vol/vol	4 max
5	Carbon dioxide	% vol/vol	2 max
6	Oxygen	% vol/vol	0.2 max
7	Hydrogen Sulphide	mg/m ³	5.49 max
8	Total Sulphur	mg/m ³	35 max
9	Hydrocarbon Dew Point	°C	-4 max at 5500 kPa abs
10	Total Mercury	µg/Nm ³	0.0
11	Gas Delivery Temperature	°C	5 – 38
12	Moisture	mg/m ³	65 max
13	Gas Delivery Pressure	Psig	Up to 1200

Unless specified otherwise, all calculations will be made at the reference conditions of 60/60 °F, 14.696 psia and real gas.

REGHUNAD RICHMAN DALIA
Company Secretary
R-ENERGY LIMITED



Daily Dawn, dt 06/11/2020

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were tested for Covid-19 before leaving for the exercise," the Russian defence ministry said.

area.
In a similar action on Tuesday, the FC seized 300kg of opium in the same area.

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حکومت پاکستان



Oil & Gas
Regulatory Authority
Government of Pakistan

NOTICE OF PUBLIC COMMENTS

APPLICATION FOR GRANT OF LICENCE BY K-ELECTRIC LIMITED, KARACHI FOR CONSTRUCTION AND OPERATION OF A TRANSMISSION PIPELINE

K-Electric Limited, Karachi (KEL) (the applicant) has applied under OGRA's Natural Gas (Licencing) Rules, 2002 for grant of license for Construction and Operation of a Transmission Pipeline. KEL is a subsidiary company of KES Power Limited. The applicant has commenced construction of this power station named as BQPS (III) (900 MWCCPP) in its Bin Qasim Power Complex in Karachi to serve the electricity needs of Karachi and adjoining areas. To fuel the same, in accordance with the decision of the CCOE, RLNG will be purchased from Pakistan LNG Ltd (PLL). Currently PLL delivers RLNG to SSGC at a Custody Transfer Station in the area of the Bin Qasim port via a FOTCO pipeline. K-Electric will take delivery of allocated gas at prior to transfer to SSGC. K-Electric is to lay this pipeline which will handle RLNG supply up to 250 (MMSCFD) at 85 bar pressure 14-inch diameter transmission line tie-in points to its facility through this project.

After completion of the requisite data / information by the applicant, the Authority has admitted the instant application for consideration.

All persons and parties who are likely to be affected by the grant of license are hereby notified to file objections, written comments or intervention requests addressed to Registrar OGRA, describing the manner in which such persons / parties shall be affected. The intervention request shall be filed alongwith fee of Rs. 500/- (bank draft) and affidavit verifying the contents of communication. Copies of the documents submitted by the applicant can be obtained on payment of prescribed charges of Rs. 2/- per page from the office of Registrar or can be downloaded from OGRA's website.

For any information required from the applicant please contact:

Syed Moonis Abdullah Alvi

Chief Executive Officer, K-Electric Limited,
KE House, 39-B, Sunset, Boulevard, Phase-II, Defense, Housing Authority, Karachi-
Telephone: 021-3263-7133, www.ke.com.pk

REGISTRAR

Oil and Gas Regulatory Authority
54-B, Fazal-e-Haq Road, Blue Area, Islamabad
Phone: 051-9244296, 051-9244090-98 (Ext-157)
Fax: 051-9244851, www.ogra.org.pk

"Say No to Corruption"

GOVERNMENT OF PAKISTAN
MINISTRY OF COMMUNICATIONS

NATIONAL HIGHWAY AUTHORITY
(PROCUREMENT & CONTRACT ADMINISTRATION SECTION)
Tender No. 6(521)

REQUEST FOR PROPOSALS

CONSULTANCY SERVICES FOR MONITORING OF NHA NETWORK THROUGH SATELLITE TECHNOLOGY

digitized the limits of Right of Way (ROW) and inventorize all assets within ROW including roads, trees, road side furniture etc., for the entire NHA network through differential GPS field surveys. NHA now

For information and record please.

Jul 10/11
Registrar thru SGC (Sindh)

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