



OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO. PROC/FC/CB/PROJ/MELA-5097/2021

TENDER DOCUMENTS
FOR
SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM
& ALLIED EQUIPMENT PACKAGE
(VOLUME – I)

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OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO. PROC/FC/CB/PROJ/MELA-5097/2021

**SUPPLY & COMMISSIONING OF POWER GENERATION
SYSTEM & ALLIED EQUIPMENT PACKAGE**

(SECTION – I)

INTRODUCTION

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1.0 **INTRODUCTION**

Oil & Gas Development Company Limited (OGDCL) is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to undertake procurement (supply) and commission of Power Generation System and Allied Equipment Package at MELA Field.

Existing MELA facility consist of gathering manifold, Separation System, Dehydration Unit, Condensate Storage, Condensate Loading System, Off Gas Compressors, Produced Water Treatment System etc.

Mela Gas Processing Plant is intended to normally process 10.5 MMSCFD of feed gas from Mela wells with a design margin of 10%.

The anticipated production capacity of the facility is as under:

- i) 11.67 MMSCFD (Separators gas and Stabilizer column top gas)
- ii) 2,251 Barrel/day of Condensate

OGDCL has engaged services of Zishan Engineers (Pvt.) Ltd. (ZEL) to prepare various procurement packages for Mela Plant including process units and related utilities.

OGDCL is inviting bids for supply and commissioning of Power Generation System and Allied Equipment Package at Mela Field.

This tender document has been prepared as per Public Procurement Regularity Authority (PPRA) requirements and provides the basis for supply & commissioning of Power Generation System and Allied Equipment Package at Mela Field.

The tender document comprises of the following:

VOLUME - I

- Introduction (Section-I)
- Invitation to Bid (Section-II)
- Instruction to Bidders (Section-III)
- Forms & Conditions of Contract (Section-IV)


VOLUME - II

- Scope of Supply & Preferred Vendor List. (Section-V)

VOLUME - III

- Data Sheets, Drawings and Specifications.

The bidders will prepare and submit their bids, as per instructions given in the ITB (Section-III) of Volume – I. The Form and Conditions of the Contract are given in Section-IV of Volume-I and Scope of Supply & Specifications given in Section-V of Volume-II & Volume-III of this tender document.

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OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO. PROC/FC/CB/PROJ/MELA-5097/2021

**SUPPLY & COMMISSIONING OF POWER GENERATION
SYSTEM & ALLIED EQUIPMENT PACKAGE**

(SECTION – II)

INVITATION TO BID

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1.0 **INVITATION TO BID**

Oil & Gas Development Company Limited (OGDCL) is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to undertake procurement (supply) and commission of Power Generation System & Allied Equipment Package at MELA Field.

Existing MELA facility consist of gathering manifold, Separation System, Dehydration Unit, Condensate Storage, Condensate Loading System, Off Gas Compressors, Produced Water Treatment System etc. Additional process and utility units, such as Condensate Stabilization Unit, Gas Compressors, instrument Air system, etc. are being added to the existing facilities.

This document has been prepared with the objective of defining the basis for Supply & Commissioning of Power Generation System & Allied Equipments for Mela Field. The Power generation System is meant to replace the existing generation system and is to be sized to cater for existing as well as new loads.

The prospective bidders are required to carefully review the document and site conditions for assessment of work involved. The Tender Documents contains required information necessary for preparation of the Bid. However, it is the sole responsibility of the Bidder to become fully informed about existing and expected conditions that may affect performance of its obligations under the Contract.

Sealed bids are hereby invited under Competitive Bidding (CB) procedure for the items as listed in the Bid Price Schedule (**Annexure-I**) of the Tender Documents. The prices shall be quoted on both FOB and CFR Karachi basis as required in the Bid Price Schedule (**Annexure-I**).

The Bids are invited on **Single Stage – Two Envelope** bidding procedure. Under this procedure, the bidders shall submit one original and one copy of their Technical bid whereas the financial bid is required in original only. No copy is required for financial bid. Tender Annexure to be added in both the bids; UN-Priced with technical Bids and Priced with Financial Bids.

Both the bids shall be submitted simultaneously in separate sealed inner and outer envelopes. The envelope containing Technical Bid must be marked clearly “**Technical Bid**” and containing Financial Bid must be marked clearly “**Financial Bid**” along with indication on the envelopes as “ORIGINAL” and “COPY”.

The prospective bidders are required to carefully review this document and within one (01) week of procuring the tender document to send the enclosed letters of Intention to Bid or Declining the Bid and Secrecy declaration.

Bid bond must be submitted along with Technical Bid. The Technical Bid will be opened at first and evaluated. The Financial Bid of only those bidders will be opened who are declared Technically Responsive.

Each bid shall be valid for 180 days from the date of technical opening of bids and should be accompanied with an upfront Bid Bond in the form of pay order/demand draft or bank guarantee for an amount of *US \$ 25,000 or equivalent Pakistani Rupees* of the Bid mentioned in the tender notice with technical bid and valid for 210 days from the date of opening of technical bids. Bid Bond (Bank Guarantee) through telex / fax shall not be acceptable. The Bank Guarantee must be issued in accordance with the format as per **Annexure-IV** of the Tender Documents. List of OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI, Section-III**, of Tender Document

OGDCL does not take any responsibility for collecting the bids from any Agency. Bidder's authorized representative may attend the Tender opening if desired. The Tender received after closing time or date shall be returned to Bidder unopened.

The OGDCL reserves the right to have the material & equipment items inspected by its own representatives or through third party.

It shall be indicated in the offer that the quotation fully conforms to Technical Specifications and Terms & Conditions of the Tender Document.

The bid shall be evaluated in accordance with the evaluation criteria as indicated in the schedule of requirement / Tender. Tenderers are advised to quote competitive prices enabling OGDCL to decide the purchase.

The award will be made in favor of lowest evaluated responsive bidder at the sole discretion of OGDCL.

On acceptance of the bid by the OGDCL, the successful bidder shall be required to furnish Performance Bond / Bank Guarantee issued by scheduled Bank of Pakistan or a branch of foreign bank operating in Pakistan for an amount equivalent to 10 % of the Contract Value for the required material in US Dollars or in currency of Bidder or equivalent in Pakistan Currency as per **Annexure-II**, of the Tender document. List of

OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI, Section-III**, of Tender Document.

The Bidders must particularly note that in case of any document found forged/fake at any stage, than Bid Bond/Performance Bond (whichever applicable) shall be en-cashed and will be liable to severe punitive action by OGDCL leading to Black Listing in addition to any other legal action, which shall be initiated against such Bidder.

The bidder who is formally selected by OGDCL shall be required to enter into a contract with OGDCL, incorporating the provisions stated in this document.

OGDCL reserves the right to increase or decrease the quantity, accept or reject any bid or part of a bid and or to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for OGDCL's action.

Bids must be delivered / dropped in the Tender box until (as mentioned in the Tender notice) hours Pakistan Standard Time (PST) on (As mentioned in the Tender notice) following address:-

Supply Chain Management Department OGDCL House,
Oil & Gas Development Company Limited,
Plot No. 3 (New No 3013) F-6/G-6, Jinnah Avenue,
Islamabad (Pakistan)
Phone No. 92-51-920023780

Bids will be opened at (as mentioned in the Tender notice) hours (PST) at the place noted above.

Clarifications or any other information if required can be obtained by addressing to OGDCL on the address given below:

- **OGDCL**

- **Manager (Foreign)-Procurement**

- Oil & Gas Development Company Limited
 - Supply Chain Management Department
 - OGDCL House, Plot No. 3 (New No. 3013) F-6/G-6,
 - Jinnah Avenue, Islamabad (Pakistan)
 - Phone No: 92-51-920023780
 - Email: ejaz_rizvi@ogdcl.com

- **Manager MELA Project**

- 9th Floor, Tower-A
 - OGDCL House, Jinnah Avenue,
 - Blue Area, Islamabad.
 - Pakistan.
 - Tel: (92-51)-920023796, 9209783
 - Email: zaheer_mirza@ogdcl.com

SECRECY DECLARATION

Oil & Gas Development Company Limited
OGDCL House, Jinnah Avenue
Islamabad (Pakistan)

**SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM & ALLIED
EQUIPMENT PACKAGE AT MELA FIELD**

Tender Enquiry No: _____

We the undersigned _____ having our principal office at _____ (hereinafter referred to as the Bidder) hereby declare to Oil & Gas Development Company Limited, Islamabad – Pakistan (hereinafter referred to as OGDCL) to accept the following terms and conditions on which OGDCL is prepared to communicate to the Bidder certain Confidential Information as hereinafter defined:

1.0 DEFINITIONS

- 1.1 The “Project” shall mean Supply & Commissioning of Power Generation System & Allied Equipment Package at **MELA FIELD**.
- 1.2 “Confidential Information” shall mean any knowledge and information in connection with the Project at any time disclosed to the Bidder by or on behalf of the OGDCL in writing, in drawing or in any other form or acquired by the Bidder from the OGDCL, as well as all data derived from such knowledge and information at the time of such disclosure or acquisition is not:
 - In the free and lawful possession of the Bidder or
 - Part of public knowledge or literature
- 1.3 “Confidential Report” shall mean all manuals, specifications, drawings, letters, faxes, emails and any other material containing Confidential Information. For the purpose of Clauses 2 and 5 Confidential Information shall include Confidential Record.
- 1.4 The confidential record shall be such information as may be given by OGDCL.

2.0 **CONFIDENTIALITY**

2.1 **The Bidder**

- Shall preserve and cause its employees to preserve the secrecy of all Confidential Information.
- Shall not use or disclose the confidential information except with the prior written consent of OGDCL and subject to the conditions contained in Clause 5, for any purpose other than the performance of the contract for the Facility or the preparation and submission of a Bid for the Facility.
 - i) Disclose to any third party or enable any third party to note that fact that the Bidder has been invited to submit a bid for the Facility and / or, if applicable, the fact that the Facility has been entrusted to the Bidder.
 - ii) Reproduce, copy or use, or disclose to, place at the disposal of or use on behalf of any third party or enable any third party to peruse, copy or use, any Confidential Information.

2.2 The undertakings under 2.1 above shall continue in so far as the Confidential Information in question has not:

- Become a part of public knowledge or literature, or
- Been disclosed to the Bidder by a third party (other than one disclosing on behalf of OGDCL) whose possession of such information is lawful and who is under no secrecy obligation with respect to the same.

3.0 **COPYRIGHT**

The copyright of the Confidential Record shall, in the absence of any express provision to the contrary be vested in OGDCL.

4.0 **RETURN OF CONFIDENTIAL RECORD**

Upon completion of the Facility, or if it is decided that the Facility will not be entrusted to the Bidder, upon notification to the Bidder of such decision, the Bidder shall return to OGDCL all Confidential Record.

5.0 **THIRD PARTY**

The Bidder shall ensure that under the terms of this Secrecy Declaration any of the Confidential Information comes to the knowledge and/or in the possession of any third party, the Bidder shall require from such third party that it shall abide by stipulations equivalent to those contained in this Secrecy Declaration.

Agreed and accepted this _____ day of _____.

Signature: _____

Name: _____

Position: _____



Zishan Engineers (Pvt.) Ltd.

An ISO 9001-2015 certified company,

47/F, Block 6, PECHS, Karachi-Pakistan
Tel: (92-21) 34393045-48 & 34310151-54
Fax: (92-21) 34533430 & 34310156
E-mail : contact@zishanengineers.com,
Web : www.zishanengineers.com

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OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO. PROC/FC/CB/PROJ/MELA-5097/2021

**SUPPLY & COMMISSIONING OF POWER
GENERATION SYSTEM & ALLIED EQUIPMENT
PACKAGE**

(SECTION – III)

INSTRUCTIONS TO BIDDERS

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1.0 **GENERAL**

1.1 **Scope of Bid and Source of Funds**

The bid pertains to supply & commissioning of Power Generation System & Allied Equipment Package for the earlier mentioned field of OGDCL. The cost to be incurred for procurement (supply) and commissioning of Power Generation System & Allied Equipment Package and will be financed from available internally generated funds.

1.2 **Definitions**

Following definitions apply throughout this document:

Owner / Company: Oil & Gas Development Company (OGDCL)

Packager / Supplier: Entity with whom the Company will execute a contract for supply & commissioning of Power Generation System & Allied Equipment Package as per this document.

Manufacturer: Entity with whom the Packager/Supplier will execute a contract for manufacturing of equipment / material as per this document.

1.3 **Joint Venture/Consortium Bids**

The bids submitted by a Joint Venture/Consortium comprising of two or more firms as partners shall comply with the requirements given below:

- a) The Joint Venture/Consortium shall nominate one of the partners as Partner In charge and this authorization shall be evidenced by submitting a power of attorney signed by partners themselves or legally their authorized signatories. The power of attorney shall be certified by Notary Public.
- b) The Partner In-charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture/consortium and the entire execution of the contract (including release of payment) shall be made with the Partner In charge.

- c) All partners of the joint venture/consortium shall be liable jointly and severally for executing and fulfilling the obligations stipulated in the contract document and shall accept joint and several liabilities for all obligations under the contract. A relevant statement to this effect shall be incorporated in the authorization mentioned under clause (a) above as well as in Bidding Form and the Form and Conditions of Contract in case of successful bid
- d) The bidder shall submit a copy of Memorandum of Understanding (MOU) entered into by the joint venture/consortium partners giving the relationship and responsibilities of the partners with respect to Supply & commissioning of Power Generation System & Allied equipment Package. (A format of responsibility matrix is given as **Annexure-III**).
- e) The bid, and in case of a successful bid the form and conditions of contract shall be signed so as to be legally binding on all partners
- f) The bidder, if successful shall be within ten (10) days of receiving the notification of award from OGDCL shall furnish a copy of contract entered into by joint venture/consortium partners.

1.4 **Agent /Distributors/ Representatives**

The agent /distributors/representatives can obtain the tender document from OGDCL and submit the bid (including the bid bond) on behalf of their principals. However, they shall be required to submit agency / distributorship / representation letter (On Principal's letter head) duly signed and stamped with authorization for the subject tender. Moreover, the Principal Bidder(s) as designated by local agent during confirmation of Bid participation could not be changed at any later stage of bidding.

1.5 **Cost of Bidding**

The bidder shall bear all costs associated with the preparation and submission of his bid and the Oil & Gas Development Co. Ltd hereinafter referred to as "Owner/Company" will in no case be responsible or liable for those costs regardless of the conduct or outcome of the bidding process.

1.6 **Bidding Process**

OGDCL is adopting the **Single stage-two envelope** bidding procedure as outlined below:

- The bid shall comprise a single package containing two separate envelopes. Each envelope shall contain separately the technical (proposal) bid and financial (proposal) bid.
- The envelopes shall be marked as “FINANCIAL PROPOSAL” and “TECHNICAL PROPOSAL” in bold and legible letters to avoid confusion.
- Initially, only the envelope marked “TECHNICAL PROPOSAL” shall be opened.
- The envelope marked as “FINANCIAL PROPOSAL” shall be retained in the custody of OGDCL without being opened.
- The technical proposal shall be reviewed by OGDCL and clarifications shall be exchanged if required
-
-
- The financial proposals of the technically qualified bidders shall be opened at a date, time and venue announced and communicated to the bidders in advance.

- OGDCL shall evaluate the financial proposals as per laid down evaluation criteria and the bid found to be the lowest evaluated shall be accepted.
- The award shall be made in favor of lowest evaluated responsive bidder at sole discretion of OGDCL. OGDCL reserves the right to increase or decrease the quantities of Power Generation System & Allied Equipment Package or award partial orders without any change in price or other terms & conditions.
- OGDCL reserves the right to accept or reject any bid or part of a bid and or to annul the bidding process and reject all bids at any time prior to award of contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for OGDCL's action.

1.7 **Manufacturer/Supplier/Packager's Scope & Responsibilities**

The Manufacturer/Supplier/Packager's Scope & responsibilities w.r.t Supply & commissioning of Power Generation System & Allied Equipment Package shall be as defined in Volume-II & III of Tender Document.

1.8 **Preferred Vendors**

The Bidder shall procure various components of Power Generation System & Allied Equipment Package from OGDCL's preferred vendors list given in Volume-II & III of this tender document. However, the bidder can propose from other reputable vendors with prior approval from OGDCL.

1.9 **Delivery & Commissioning of Power Generation System & Allied Equipment Package**

The Bidders are required to adhere to the maximum Delivery Period of (08) months on CFR Karachi Sea Port basis from the date of establishment of letter of credit (L/C). Partial Shipment (s) within delivery period (s) will be accepted. The bidders are encouraged to indicate the delivery period less than Eight (08) months.

The commissioning of Power Generation System & Allied Equipment Package shall be undertaken by the Supplier/Packager within six (06) months after CFR Karachi Sea Port delivery. OGDCL in this connection shall issue a notification and Supplier/Packager shall mobilize within three (03) weeks of this notification at Project Site for commissioning of supplied System and allied equipment package.

2.0 **TENDER DOCUMENT**

2.1 **Contents**

As stated earlier, the tender document comprises of following together with any addenda that may be issued from time to time:

VOLUME - I

- I) Introduction
- II) Invitation to Bid
- III) Instruction to Bidders
- IV) Forms & Conditions of Contract

VOLUME - II

- V) Scope of Supply & Specification and Preferred Vendor List.

VOLUME - III

- Specifications, Data Sheets and Drawings.

The prospective bidders shall carefully study and examine all sections of the document and shall comply with the stipulated requirements. Failure to furnish all information required by the tender document or submission of bid not substantially responsive to the tender requirement in every respect will be at Bidders risk and may result in the rejection of the Bid

2.2 **Clarifications**

A prospective bidder requiring any clarification of the Tender document or requiring any data may notify OGDCL in writing by fax or email at given below addresses. However, only such clarifications will be entertained which have been received before two (02) weeks of bid submission:

- **OGDCL**

- **Manager (Foreign)-Procurement**

- Oil & Gas Development Company Limited
 - Supply Chain Management Department
 - OGDCL House, Plot No. 3 (New No. 3013) F-6/G-6,
 - Jinnah Avenue, Islamabad (Pakistan)
 - Phone No: 92-51-920023780
 - Email: ejaz_rizvi@ogdcl.com

- **Manager MELA Project**

- 9th Floor, Tower-C,
 - OGDCL House, Jinnah Avenue,
 - Blue Area, Islamabad.
 - Pakistan.
 - Tel: (92-51)-920023796, 9209783
 - Email: zaheer_mirza@ogdcl.com

OGDCL will respond in writing to any request for clarifications of the Tender Document, which it receives not later than two (02) weeks prior to deadline for the submission of bids prescribed in the Tender Document.

2.3 **Amendment**

At any time prior to the deadline for submission of bids, a modification in the bidding documents in the form of an addendum may be issued in response to a clarification requested by a prospective Bidder or even whenever the OGDCL considers it beneficial to issue such a clarification and / or amendment to all Bidders.

Any addendum/amendment/clarification shall form part of the tender document and shall be posted on OGDCL website or through press corrigendum. The prospective bidders should acknowledge receipt of any such addenda/amendment in the tender document.

In order to allow prospective bidders reasonable time to take the addenda/amendment/clarification into account in preparing their bids OGDCL at its discretion may extend the deadline for submission of bids.

3.0 **PREPARATION OF BIDS**

3.1 **Language of Bids**

The Bids prepared by the Bidder and all correspondence and documents relating to the Bid exchanged between the Bidder and OGDCL, shall be written in English language. Any supporting documents and printed literature furnished by the Bidder written in another language should be accompanied by an English translation of its pertinent pages in which case, for purposes of interpretation of the Bid, the English translation shall govern.

3.2 **Documents Comprising the Bid**

The Bid to be submitted by the Bidder shall comprise Technical Bid and Financial Bid:

3.2.1 **Technical (Proposal) Bid**

The Technical (Proposal) Bid shall consist of the following:

i) **General**

- a) Corporate & Financial Information of Manufacturer / Supplier / Packager
- b) Original Pay order/Bank Draft/Bank Guarantee as Bid Bond for an amount of US \$ 25,000 or in equivalent Pak Rupees as per format given in **Annexure-IV**. List of OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI** of Tender Document.
- c) An un-priced copy of **Annexure-I** mentioning “quoted” or “not quoted” against each item duly signed and stamped by the Principal along with a statement confirming the bid validity period as per tender requirement along with other terms and conditions.
- d) Documentary evidence established in accordance with Instruction 5.5 that the bidder is eligible to bid and is qualified to perform the Contract if his bid is accepted.

- A certificate to the effect that Bidder is authorized by the good's manufacturer or producer to supply the goods to or in the OGDCL's Country.
 - That the bidder has the financial, technical and production capability necessary to perform the Contract.
- e) Documentary evidence established in accordance with Instruction 5.5 that the Power Generation System to be supplied & commissioned by the bidder are eligible goods and conform to the Tender Document.
- The documentary evidence of Power Generation and Allied Equipment Package eligibility shall consist of a statement, in which the country of origin of the equipment offered, shall be confirmed by a certificate of origin issued at the time of shipment. Further note that package supplied & commissioned under this contract shall have origin in the countries having bilateral trade relations with Islamic Republic of Pakistan.
 - The documentary evidence of the equipment's conformity to the Tender Document may be in the form of literature, drawings and data and shall furnish a detailed description of the goods and essential technical and performance characteristics
- f) Manufacturer/Packager and its joint venture partner's (if any) profile as per format given in **Annexure-V**.
- g) Plan for supplying required Power Generation System & Allied Equipment Package covering all components including Design, Procurement (Supply) & Commissioning and human resource deployed.

- h) A reference list of similar Generation System supplied & commissioned in the country of origin, Pakistan and other countries during the last Ten (10) years (As per format given in **Annexure-VI**). The documentary evidence in the form of Copies of Supply Order/Contract/purchase order and/or Performance/Completion Certificates should be provided. Only those Orders/Projects whose documentary evidence (including performance/completion certificates) have been submitted will be considered in the evaluation.
- i) Operational history of Power Generation System and Allied Equipment Package similar to those proposed to be supplied covering:
- Detailed specifications and capacity
 - Site/Location where the Power Generation is installed
 - Year of Installation
 - No of years in continuous operation
 - Annual down time for preventive maintenance
 - Details of preventive maintenance required to be performed
- j) Bidder's project organization plan and resources (i.e. physical and human resources) to be deployed. The details of physical resources and curriculum vitae of key personnel are required to be provided as per format given in Annexure-VII Curriculum Vitae (CVs) of commissioning & testing personnel and Installation Expert (As per format given in **Annexure-VII**).
- k) Description of Quality Assurance and Quality Control procedures and HSE, QA/QC organization which the Bidder intends to adopt/follow during manufacturing/packaging of Power Generation System and Allied Equipment Package.
- l) Memorandum of Understanding (MOU) executed by joint venture partners with respective responsibilities
- m) Copies of ASME, ISO and other certification/accreditations.
- n) Authority Letter in the name of representative signing the Bid.

- o) Duly initialed & stamped copy of Scope of work & Technical Details & Drawings, Form & Conditions of Contract as well as Integrity and Ethics Undertaking as per format given in **Annexure-VIII-A & B.**
- p) Delivery & commissioning schedule: Target delivery date(s) (Item-wise) starting from the date of establishment of L/C
- q) Data Summary Sheet (Technical Bid) as per format given in **Annexure-IX.**
- r) Statement that the goods are "Brand New"
- s) Statement that none of the equipment to be supplied under the contract has reached end-of-production / end-of life (i.e. is not obsolete) and / or in the production phasing out process.

ii) **Technical Details**

The required technical details in connection with supply & commissioning of Power Generation System & Allied Equipment Package are presented below:

- a) The technical details to be provided as per requirement mentioned in clause 1.7 of 165-2-SPE-016 (Volume-II) and shall include but not limited to following:
 - Generator Datasheet.
 - Switchgear Datasheet.
 - Single Line Diagram with all Protections and Interlocks.
 - OEM Catalog/Spec sheets of Generators, Switchgear, Unit Control System / Synchronization system, etc.
 - Dimension and weight of all Equipment including canopy details.
 - Utility Requirement / Fuel Consumption Data.

- b) Details of major components of Power Generation System & Allied Equipment Package proposed to be supplied including the following:
- Sources/Country of origin
 - Name and complete address of manufacturers/sub-supplier
 - Profile of sub-suppliers, their capacity & credentials
- c) Commissioning plan with responsibilities of individual team members (As per **Annexure-X**).
- d) Details of available after sales technical back-up services and infrastructure and its location.
- e) Item-wise list of Start-up and commissioning spares.
- f) Item-wise list of recommended spares for two (02) years continuous operation.
- g) Net and gross shipping weights, overall dimensions and total volume of each shipping unit.
- h) Bid should conform in all respects to the applicable specifications, drawings and instructions forming part of the Tender Document.
- i) Complete description of Power Generation System and Allied Equipment Package proposed to be supplied its data sheets, technical specifications and technical catalogues (including characteristics curves) as per tender requirement.
- j) Bidders must state any deviation from material or other standards specified, separate list of proposed standards shall then be attached to the bid indicating the appropriate standards proposed by the Bidder, stating in each case the comparable standards specified.
- k) Comments or deviations/exceptions (if any) to the scope of supply, technical specifications, other relevant codes and standards, commercial and Contractual Conditions specified in the Tender Document (**Annexure-XIII**).

3.2.2 **Financial Bid**

- a) Bidding Form as **Annexure – XI**.
- b) Photocopy of Bid Bond for an amount of US Dollars 25,000 or in equivalent Pak Rupees.
- c) Bid Price Schedule duly signed and stamped by the Principal shall indicate the quoted prices of the Power Generation System and Allied Equipment Package as contained therein along with other terms and conditions as per **Annexure-I**.
- d) Expenses of Inspection / witness testing by OGDCL's Representatives.
- e) Charges for Pre-commissioning, Commissioning, Startup, Performance Testing & Installation Expert Charges for supervision of installation of Power Generation System & Allied Equipment Package inclusive of travel & allowances. OGDCL shall provide boarding & lodging & local transport & security arrangement.
- f) Statement that the duties taxes levied by the exporting country are included.
- g) Statement that the prices must be inclusive of all applicable taxes as per Tax Clause # 37, Section- IV, ITB of this tender document.
- h) Data Summary Sheet (Financial Bid) as per format given in **Annexure–XII**.

3.3 **Bid Form and Price Schedule**

The Bidder shall complete the Bid Form (**Annexure-XI**) and Bid Price Schedule (**Annexure-I**) furnished in the Tender Document, indicating the Power Generation System & Allied Equipment Package to be supplied, a brief description of the supplied system(s), their country of origin, quantity and prices.

3.5 **Bid Bond**

- 3.5.1 The Bidder shall furnish, as part of its Technical Bid, original Bid Bond (**Annexure-IV**) for an amount of *USD 25,000 (US Dollars Twenty Five Hundred Thousand Only)* in US Dollars or equivalent in Pak Rupees. The Bid Bond shall be valid for Two Hundred & Ten Days (210) days counting from day of technical bid opening. List of OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI** of Tender Document.
- 3.5.2 The Bid Bond is required to protect OGDCL against the risk of Bidders' conduct which would warrant the Bid Bond encashment pursuant to Instructions given in following paragraphs.
- 3.5.3 The Bid Bond shall be in the form of Pay Order/Demand Draft or Bank Guarantee issued by any Bank listed in **Annexure-XVI** of Tender Document. The Bid Bond shall be denominated in United States Dollars or in equivalent in Pak Rupees
-
- 3.5.4 Any Bid not secured in accordance with Instructions 3.5.1 and 3.5.3 will be rejected by OGDCL as non-responsive.
- 3.5.5 Unsuccessful Bidders' Bid Bond will be discharged/returned as promptly as possible but not later than 30 days after the expiry of the period of Bid validity prescribed by OGDCL, pursuant to Instruction 3.8.
- 3.5.6 The successful Bidder's Bid Bond will be discharged upon the Bidder's executing the Contract, and furnishing the required Bank Guarantee/ Performance Bond.

- 3.5.7 The Bid Bond may be forfeited:
- i. If a Bidder withdraws its Bid during the period of Bid validity specified by the Bidder on the Bid Form; or
 - ii. In the case of a successful Bidder, if he fails:
 - To furnish Performance Bond in accordance with clause-6.5
 - To sign the Contract in accordance with clause-6.4.
 - Document found forged/fake at any stage
- 3.5.8 The format of the Bank Guarantee shall be in accordance with the standard format attached as **Annexure-IV**.
- 3.5.9 The bidder must particularly note that in case of submission of forged Bid Bond they will be liable to severe punitive action by the OGDCL leading to Black Listing of the Local Agent as well as the Principal in addition to any other legal action that shall be initiated against such Bidder.
- 3.5.10 The OGDCL reserves the right to check authenticity of Bid Bond from the concerned Bank.

3.6 **Bid Prices & Payment Terms**

3.6.1 Bid Prices

The Bidder shall specify on Price Schedule (**Annexure-I**) of this Tender Document) the unit prices and total Bid Price of Power Generation System & Allied Equipment Package, it proposes to supply & commission the same under the Contract.

The prices quoted by the Bidder shall be fixed and not subject to variation on any account. A bid submitted with an adjustable price quotation will be treated as non- responsive and rejected.

The prices shall be for complete scope and obligations detailed in this Tender Document. The quoted prices shall be firm and fixed for the Contract performance period and shall not be subject to escalation on any account.

The prices specified on the Price Schedule to be submitted in Financial Bid shall be entered separately in the following manner:

- The prices of Power Generation System & Allied equipment to be quoted are firm “FOB” Sea Port of Shipment basis including all FOB charges i.e. boxing, packaging, documentation, inland freight, dispatch of shipping documents through courier services and any other charges.
- The prices of Power Gas System and Allied Equipment Package quoted on CFR Sea Port Karachi, Pakistan basis.

The prices shall be inclusive of all applicable taxes as per Tax Clause #37 Section-IV, ITB of this tender document. Tax deductions shall be made accordingly.

OGDCL may require installation expert for supervision during erection/installation of Power Generation System & Allied Equipment Package. The services of the expert engineer shall be provided on lumpsum basis. The charges will be quoted on the following basis:

- One (01) Installation Expert
- Respective Manday Rate
- Travel (Air ticket & related expenses)
-

The pre-commissioning, commissioning, start-up & performance testing of Power Generation System & Allied Equipment Package shall be Packager’s responsibility; accordingly, charges shall be quoted on lumpsum basis. Time for pre-commissioning, commissioning, start-up and testing activities shall be indicated by the Supplier/Packager. The bidder shall provide the detailed breakup for the man-days involved for each team members and their respective man-day rates. The charges shall be quoted on following basis

- No. of commissioning experts
- Respective manday rates
- Travel (Air Ticket & related expenses)

Payments for all services shall be made on actual man-days consumed if they are less than estimated man-days provided by the bidder/packager otherwise if the man-days exceed the estimated man-days for completion of

job no additional charges shall be provided irrespective of number of visits for completion of the job.

OGDCL shall provide boarding/lodging and transport to Supplier/packager's expert involved in installation supervision, pre-commissioning, commissioning, start-up, testing work and training at Project site. The transport will be provided at Project site from and to nearest civil airport. OGDCL will also provide appropriate security arrangement.

The bidder shall also provide the on-site training services w.r.t operation and maintenance to all required disciplines of OGDCL personnel for a period of five (05) days. The Bidder shall submit the price in the financial bid on lump sum basis with indication of estimated days for the training and other details.

Third Party Inspection Agency shall be appointed by OGDCL.

The bidder shall quote Expenses of Inspection/witness testing (FAT) by OGDCL Representatives on the following basis:

- FAT for Generators: Minimum One (01) visit for duration of four (04) days by Two (02) Engineers.
- FAT for Switchgear: Minimum One (01) visit for duration of two (02) days by Two (02) Engineers.

Note: Bidder to propose the number of FAT's with breakup and its schedule (number of days and Engineers will be same for each FAT).

- Full Fare Economy Class returns tickets.
- Hotel (Four star) Room on single occupancy basis for each person.
- Assistance/Documentation in obtaining Visa for both main and alternate nominated candidates .
- Local Transportation

3.6.2 **Payment Terms**

▪ **Supply**

For the contract price of supply of Power Generation System & Allied Equipment Package (including spares, testing expenses and operational consumables), Contract will be signed and OGDCL shall establish first irrevocable letter of credit in currency of Contract and as per requirements of State Bank of Pakistan, Custom authorities and other

government organizations, Terms and Conditions of L/C are given in **Annexure-XIV-A.**

The letter of credit for the supply part shall be valid for a period of fifteen (15) months from the date of its establishment.

In case of Chinese bidder/firm the payment to be quoted and paid in Chinese Currency (Yuan) only.

The Bank charges for establishment of L/C, additional confirmation and any subsequent amendments in L/C will be borne as follows:

- a) All charges for L/C opening inside of Pakistan will be borne by OGDCL.
- b) All charges for L/C outside Pakistan and confirmation will be to the beneficiary's account the LC established.

The payment terms for supply of Power Generation System & Allied Equipment Package are given below:

-
- Seventy Five (75) percent of the shipment value shall be paid by OGDCL on shipment of Power Generation and Allied Equipment Package ordered. The partial shipment/partial payment will be allowed. The payment under the L/C shall be effected upon submission of documents listed in Annexure-XIVA (Terms and conditions of the L/C for supply)
- Five (05%) of the contract price shall be paid upon complete delivery and after inspection On submission of Manufacturer, original invoice (duly verified by OGDCL), accompanied by a certificate issued by OGDCL that ordered equipment has been received, inspected and accepted. Supplier shall be responsible for completeness of supplies by inspecting the material arrived at site before the installation of package at site by sending OEM's representative(s) by participation the inspection performed by OGDCL.

- Twenty (20) percent of the contract price shall be paid after thirty (30) days of successful commissioning on submission of original Supplier/Packager invoice (duly verified by OGDCL) accompanied by a certificate issued by OGDCL that the Power Generation System & Allied Equipment Package has been successfully commissioned or Twenty Four (24) months from date of supply of Power Generation System & Allied Equipment Package & inspection/acceptance by OGDCL in Pakistan, whichever occur first.

- **Services**

For the contract price of services portion to be provided by the Supplier/packager w.r.t supply of Power Generation System & Allied Equipment Package Service Order will be signed by OGDCL & Packager/Supplier simultaneously (at the time of contract signing), 2nd irrevocable L/C shall be established by OGDCL in currency of contract and as per requirements of State Bank of Pakistan, Custom Authorities and government authorities. Terms & Conditions of L/C for Services are given in **Annexure-XIV-B**.

The letter of credit for the services part shall be valid for a period of seven (07) months from the date of its establishment.

The Bank charges for establishment of L/C, additional confirmation and any subsequent amendments in L/C will be borne as follows:

- a) All charges for L/C opening inside of Pakistan will be borne by OGDCL.
- b) All charges for L/C outside Pakistan and confirmation will be to the beneficiary's account the LC established.

The charges for the following services shall be paid by OGDCL to Manufacturer/Supplier in the currency of contract as per requirements of State Bank of Pakistan, and government authorities in the 2nd irrevocable L/C established by OGDCL.

- **Supervision Services during Erection/Installation**

The charges of expert involved in providing supervision services during erection/installation of Power Generation System & Allied Equipment Package shall be paid on actual man-days (if less than man-days are consumed than estimated otherwise on lumpsum basis) in Thirty (30) days of successful completion of services and submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the services have been provided as per OGDCL's requirement.

- **Pre-Commissioning, Commissioning & Start-Up, Performance Testing Charges**

The charges for Pre-Commissioning, Commissioning and Start-Up, performance testing of Power Generation System & Allied Equipments shall be paid by OGDCL on actual man-days (if less than man-days are consumed than estimated otherwise on lumpsum basis) in thirty (30) days of successful commissioning on submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the Power Generation System & Allied Equipment has been successfully commissioned.

- **Training at Site**

The charges for providing training to OGDCL personnel at Project Site shall be paid by OGDCL on lumpsum basis within thirty (30) days of successful completion of training program against Manufacturer/Packers original invoice duly verified by OGDCL.

All services payment are subject to deduction of income tax and provincial sales tax

3.7 **Bid Currencies**

Bid Prices shall be quoted in the US Dollars or currency of Bidder's country. However in case of Chinese bidder the bid price should be only in Chinese Currency (Yuan). Payment shall only be made in Chinese Currency (Yuan) to Chinese bidders

3.8 **Bid Validity**

3.8.1 The bid shall remain valid and open for acceptance for one hundred and eighty (180) calendar days after the date of Technical (Proposal) Bid

opening prescribed by OGDCL. A bid valid for a shorter period may be rejected by OGDCL as non- responsive.

- 3.8.2 In exceptional circumstances prior to expiry of the original bid validity period, the bidder may be requested in writing for an extension in the period of validity. A bidder agreeing to such request shall not be permitted to modify his bid and shall be required to correspondingly extend the validity of his Bid Bond.

- 3.8.3 OGDCL may solicit the bidder's consent to an extension of the period of validity. The request and the response there to shall be made in writing (by fax or e-mail). The bid bond provided under Instruction 3.5 shall also be suitably extended. A bidder may refuse the request without forfeiting its bid security. A bidder granting the request will not be required nor permitted to modify its bid.

3.9 **Format and Signing of Bid**

- 3.9.1 The bidder shall prepare one (01) original & one (01) copy of technical bid and one (01) original financial bid, clearly marking "Original Bid" and "Copy of Bid" as appropriate. In the event of any discrepancy between them, the original shall govern.
- 3.9.2 The original and copy of Bid shall be typed or written in indelible ink. Bids must be properly signed by the Bidder or, and shall contain the full name and address of the Bidder. Each page of the Bid and its Annexure must be initialed and stamped by the person or persons signing the Bid. The name of all persons signing the Bid shall be typed or printed below their signatures. Bidders shall be deemed to warrant that the signatories have the necessary delegated authority to sign the Bid and to bind the Bidder.
- 3.9.3 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.
- 3.9.4 All copies of the bid shall be signed by the Bidder or a person (s) duly authorized to bind the Bidder to the Contract. Proof of the authorization shall be furnished in the form of a written Power of Attorney which shall accompany the bid. All pages of the bid, where entries are made, shall be initialed by the person (s) signing the bid.

4.0 **SUBMISSION OF BIDS**

4.1 **Sealing and Marking of Bids**

- 4.1.1 As stated earlier, OGDCL is following two stage – two envelop bidding process. Accordingly, bid to be submitted shall comprise of a single package containing two separate envelopes. Each envelope shall contain separately the technical (proposal) bid and financial (proposal) bid. The bidders shall submit two (02) copies of the technical bid, one of which shall be marked the “Original” and the other “Copy”. Financial Bid is required in original only.

- 4.1.2 Technical and financial (proposal) bids shall be submitted in separate envelopes.
- 4.1.3 Each bid shall be sealed in inner and outer envelopes with the outer envelope marked as follows: -

Manager Foreign Procurement
Supply Chain Management Department
Oil & Gas Development Company Limited (OGDCL)
First Floor, OGDCL House,
Plot No.3, Jinnah Avenue, Blue Area,
Islamabad - Pakistan.
Telephone: 92-51-92002 3780

The envelop shall also bear the following clarifications:

**BID FOR SUPPLY & COMMISSIONING OF POWER
GENERATION SYSTEM ALLIED EQUIPMENT PACKAGE FOR
MELA FIELD**

**TENDER ENQUIRY NO. _____
DO NOT OPEN BEFORE (AS MENTIONED IN TENDER
NOTICE)**

The sealed envelope shall indicate the name and address of the Bidder to enable the bid to be returned unopened in case it is declared LATE.

If the outer envelope is not marked as instructed above, the OGDCL will assume no responsibility for the misplacement or premature opening of the bid.

- 4.1.4 OGDCL shall not be responsible for the premature opening or misplacement of any Bid not clearly marked and addressed in accordance with Instruction 4.1.3.

4.2 Deadline for Submission of Bids

- 4.2.1 The Bids must be reached and received by OGDCL at the address specified under Instruction 4.1.3 on or before the prescribed deadline date no later than at ____ Hours (PST) mentioned in tender notice. Bid

received later than the specified date and time will not be entertained. OGDCL does not accept any responsibility for Bids detained, delayed or misplaced in transit by mail/courier service or otherwise.

- 4.2.2 OGDCL may, at its discretion, extend this date for the submission of Bids by amending the Tender Document in accordance with Instruction 2.3 in which case all rights and obligations of the OGDCL and Bidders will extend likewise.
- 4.2.3 In case due date of bids opening falls on holiday, the bids will be opened on next working day.

4.3 **Late Bids**

Any Bid received by the OGDCL after the prescribed deadline for submission of Bids, pursuant to Instruction 4.2 shall be rejected and returned unopened to the Bidder.

4.4 **Modifications and Withdrawal of Bids**

- 4.4.1 The Bidder may modify or withdraw its Bid after the bid's submission, provided that written notice of the modification or withdrawal is received by OGDCL prior to deadline prescribed for submission of the Bids.
- 4.4.2 The Bidder's modifications or withdrawal notice shall be prepared, sealed, marked and dispatched as for the bid in accordance with the provisions of Instruction 4.1. A withdrawal notice may also be sent by fax or e-mail but followed by a signed confirmation copy, postmarked not later than the deadline for submission of the Bids.
- 4.4.3 No Bid shall be modified subsequent to the deadline for submission of the Bids.
- 4.4.4 No Bid may be withdrawn in the interval between the date for submission of Bids and the expiry of the period of Bid validity specified by the Bidder on the Bid Form. Withdrawal of a Bid during this interval may result in forfeiture of Bidder's Bond under Instruction 3.5.7.

5.0 **BID OPENING AND EVALUATION**

5.1 **Bid Opening**

- Sealed bids received shall be examined for correct identifying information on the envelope. If the inscription does not clearly shows as per in Instruction given in Section 4.1, the entire bid may be returned unopened. Also bids received after closing date shall be returned un-opened

- OGDCL will open the Technical Bids, in presence of Bidder’s representatives who choose to attend, at as mentioned in tender notice (PST) on as mentioned in tender notice at the following location:

Supply Chain Management Department
Oil & Gas Development Company Limited (OGDCL)
First Floor, OGDCL House,
Plot No.3, Jinnah Avenue, Blue Area,
Islamabad - Pakistan.
Telephone: 92-51-92002 3780, 3652

The Bidder’s representatives who are present shall sign a register evidencing their attendance.

- The Bidder’s names, bid prices, requisite Bid Bond, including bid price modification and bid withdrawals, if any, will be announced at the bid opening.
- The Bidders' representatives who are present shall sign a register evidencing their attendance. OGDCL shall prepare minutes of the bid opening.
- The Bidder’s names, bid prices, requisite Bid Bond, including bid price modification and bid withdrawals, if any, will be announced at the bid opening

5.2 **Clarification of Bidding Documents**

The Bidders are expected to carefully examine all instructions, forms specifications in the bidding documents. Any bidder in doubt as to the exact meaning or interpretation of any part of the bidding documents must immediately seek clarification in writing from the OGDCL at mailing address indicated in the “INVITATION FOR BID”. The OGDCL will respond in writing to any request for information or clarification of the bidding documents which is received not later than TWO (02) weeks prior to deadline for submission of the bids prescribed by the OGDCL.

The bidder should likewise notify the OGDCL of any contradictions, obscurities and omission in the Bidding Documents if clarification of these is necessary for the clear understanding of the documents and for preparation of the bid such enquiries must reach the OGDCL not later than two weeks prior to the deadline for submission of the bids.

OGDCL may ask bidders individually for clarification of their bid during the process of examination, evaluation and comparison of bids. The request for clarification and the response shall be in writing.

5.3 **Criteria for Summary Rejection of Bid**

The Bids are not meeting the following mandatory criteria shall be summarily rejected without right of appeal:

- Bid must reach at the specified OGDCL address before “_____” hours PST on _____ 2021 as mentioned in clause 4.2.
- Bid must not be submitted in form of fax or email OR telegram/telex/direct to the purchaser.
- Fax / Copy of Bid received with original Bid Bond will be accepted provisionally provided original bid is received by OGDCL within 10 calendar days after bid opening. If the original bid is not received within the stipulated period of 10(ten) calendar days counting from the date of tender opening, the bid shall stand rejected.
- The Bid shall comprise of two separate proposals i.e “Technical Proposal” & “Financial Proposal”. Two copies of each shall be prepared. One set marked “ORIGINAL” and other set marked “COPY”.
- Bid must be prepared in English Language
- Bid must be valid for “180” days from the Date of Technical Bid opening.
- Bid must be accompanied by a Bid Bond for an amount of **USD 25,000** in *US Dollars* or equivalent in Pak Rupees as specified under clause 3.5.
- Bid Price Schedule (**Annexure-I**) of the Principal in original, dully filled in, signed and stamped by the Principal must be submitted along with bid giving all necessary details.
- Un-priced Data Summary Sheet (Technical/Financial) as per **Annexure-IX/XII** must be filled in and submitted along with the bid.
- Bid must be on Company’s original letter head/pad.

- Any fax bid with fax / copy of Bid Bond shall be rejected.
- Bid must be quoted for complete as per scope of work given in the tender document.
- Bid must include all annexure i.e. Checklists, bidding form, blacklisting affidavit, data summary sheet, corporate information etc.
-

5.4 **Preliminary Examination**

- 5.4.1 OGDCL will examine the bids to determine whether they are complete whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, whether the bids are generally in order.
- 5.4.2 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between words and figures, the amount in words shall prevail.
- 5.4.3 Prior to the detailed technical and financial evaluation, pursuant to clause 5.7, the OGDCL will determine the eligibility requirements of bidder and goods.

5.5 **BIDDER QUALIFICATION CRITERIA:**

The bidder who intends to participate in this supply, installation & commissioning of the Gas generator set bid, must fulfill the following requirement / parameters for qualification. Bidder should provide documentary proof otherwise bid will be considered as technically non- responsive and will be rejected. The bidder to provide the following mandatory data for evaluation/qualification:

- 5.5.1 Bidder must submit the Authorization Letter from the Packager in favor of bidder to bid for Subjected Case.

Manufacturer/OEM of Engine

- 5.5.2 The Bidder offered Manufacturer/OEM shall have at least Twenty (20) years of experience of Manufacturing & supply of gas engines. The offered brand must have population in oil & gas plants, refineries & Petrochemical sector in Pakistan, Provide verifiable proof. Spares & Service Facilities of (Top End, Major Overhauling and site services etc.) must be available in Pakistan. Provide verifiable documentary evidence.

5.5.3 At least 05 Gas Gensets (min. 500 KW capacity) of the offered OEM/Brand should be in use in oil & gas sector , refineries & Petrochemical sector with in Pakistan during

- last 15 years. Verifiable proof should be provided. Supply of Gas Gensets outside Pakistan will not be considered.
- 5.5.4 Bidder offered Manufacturer/OEM should have established dedicated workshop facilities (both for parts & services) within Pakistan for after sales service & warranty/guarantee of the Gas generator set. Spares and service facilities of (Top End, Major Overhauling and site services etc.) of OEM or Authorized Partner / Distributor / Dealer must be available in Pakistan. Provide OEM Authorization letter showing confirmation and verifiable contact details of existing after sales services facilities in Pakistan.
- 5.5.5 The workshops of the Manufacturer/OEM should have sufficient qualified manpower, all tools, equipment, testing facility, overhead cranes, cleaning facility etc. for maintenance, top end & major overhauling of the gas engines & generators. OGDCL reserved the right to visit the workshop facility to verify the submitted detail. OEM Confirmation letter for availability of such facilities in Pakistan shall be provided with technical bid regarding overhauling services to be provided.
- 5.5.6 The bidder should submit the satisfactory performance certificates from the clients for the after sale services through the workshop facility within Pakistan. In case bidder is not the authorized Dealer of OEM, then Authorization letter from OEM will be required, showing the availability of After Sales services in Pakistan.
- 5.5.7 List of all the offices and service agencies across Pakistan to be provided.

Packager of GenSet

- 5.5.8 The bidder offered Packager shall have at least Ten (10) Years packaging experience of Renowned Manufacturer/OEM.
- 5.5.9 At least 05 Gas Gensets (min. 500 KW capacity) of the re-known OEM/Brand packaged by the same packager should be in use in oil & gas sector, refineries & Petrochemical sector with in Pakistan. Verifiable proof should be provided. At least 03 Gas gensets must be in operation for last 05 years.
- 5.5.10 Bidder shall submit the HSEQ policy of the Packager.
- 5.5.11 In case of bid submitted by any Joint venture companies, the experience of one COMPANY will govern e.g Thirteen years' experience of one COMPANY & Seven years of the other COMPANY will not be considered as twenty years.
- 5.5.12 COMPANY shall provide certified copy of valid NTN/GST certificates (In case of local bidders).
- 5.5.13 Listed status of the COMPANY / other COMPANY profile.
- 5.5.14 Bidder declared as black listed at PPRA website will not be entertained.
- 5.5.15 Bidder shall have strong financial strength to meet the execution of Contract.

5.6 Clarification of Bids

To assist in determining a bid's responsiveness the Bidder may be asked for a clarification of his bid.

5.7 **Technical Evaluation**

5.7.1 **Technical Evaluation**

The technical bids will be examined and evaluated with the objective of assessing their eligibility, compliance, completeness, conformity to the specifications, guarantee/warranty requirements and responsiveness to the requirements stipulated in the Tender Document. Following factors will be considered for evaluation:

- Bid must be prepared as instructed vide clause 3.0 hereof.
- Bid must be quoted for complete scope of work given in tender document.
- Technical qualification, experience and capabilities of the bidder.
- Adherence to Codes & Standards
- Quality of proposal and compliance with tender requirements.
- Quality of proposed Project Execution organization and resource plan.
- ISO, API & other certifications/accreditations.
- Bidder's Profiles and List of Customers/Buyers.
- Status of bidder's compliance with eligibility requirements of bidder and goods
- Project Completion Period.
- Warranty/Guarantee.
- Financial Strength

A bid determined to be substantially non-responsive will be rejected.

During evaluation certain clarifications may be sought from the Bidders or discussions may be held with them for the purpose of Bid conditioning/evaluation. Final evaluation shall be carried out in view of the responses received from the Bidder against those queries and discussions held. Based on this evaluation exercise the bids will be determined technically responsive and acceptable. These bidders will then be asked to submit supplementary financial bids.

5.7.2 **Financial Evaluation**

The financial bids of technically qualified bids will be opened.

The evaluation of financial bids will involve:

- Check and confirm the amount of Bid Bond(s).
- Conversion to Pak Rupees of foreign currency amount based on State Bank of Pakistan/National Bank Exchange Rate Selling prevailing on the date of technical bid opening.

- Arithmetic errors in computation and summation shall be checked. The errors shall be corrected in the following manner:
 - a) Where there is a discrepancy between amounts in figures and in words, the amount in words shall govern and
 - b) Where there is a discrepancy between the unit rate and the total amount derived from the multiplication of the unit rate and the quantity, the unit rate as quoted shall govern.

The award will be recommended in favor of bidder whose evaluated price is lowest.

5.8 **Contacting OGDCL**

- 5.8.1 Subject to Instruction 5.2 and 5.3 no Bidder or his agent shall contact OGDCL on any matter relating to its Bid, from the time of the Bid opening to the time the Contract is awarded.

- 5.8.2 Any effort by Bidder to influence OGDCL in its Bid evaluation, Bid comparison or Contract award decisions may result in the rejection of the Bidder's Bid.
- 5.8.3 All correspondence technical/financial shall be made with authorized representative of Supplier/Packager.
- 5.8.4 All correspondence relating to technical matters before bid submission or clarifications during evaluation etc. will be directed to OGDCL.

6.0 **AWARD OF CONTRACT**

The award of contract shall be made to the Bidder whose bid has been determined to be the lowest evaluated bid, after considering all factors and who meet the appropriate standards of capability and financial responsibilities.

OGDCL will award the Contract to the successful Bidder whose bid has been determined to be the lowest evaluated, responsive bid, provided further that the Bidder is determined to be qualified to satisfactorily perform the contract.

6.1 **OGDCL's Right to Accept any Bid and to Reject any or all Bids**

OGDCL reserves the right to accept or reject any bid or part of a bid and to annul the bidding process and reject all bids at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for OGDCL's action.

Unsolicited advice / clarification and personal approaches by the Bidder at any stage of evaluation are strictly prohibited and shall lead to disqualification.

6.2 **OGDCL's Right to Vary the Scope of Contract**

OGDCL reserves the right at the time of award of Contract to make addition and deletions in any component of scope of work or vary the scope of work given in the Tender Document.

6.3 **Notification of Intent to Award**

- 6.3.1 Prior to the expiration of the period of bid validity, OGDCL will notify the successful Bidder in writing by fax or courier service its intent to award the contract. The Contract will be executed subject to satisfactory negotiation of the terms and conditions of the Contract.

6.3.2 Upon the successful bidder's furnishing of Performance Bond pursuant to Instruction 6.5, OGDCL will promptly notify each unsuccessful bidder and will discharge its Bid Bond pursuant to Instruction 3.5.5.

6.4 **Signing of Contract**

6.4.1 At the same time as OGDCL notifies the successful Bidder of its intent to award the Contract, OGDCL will send the Bidder the Form and Conditions of Contract (Section –IV) provided in the Tender Document, incorporating all agreements between the parties for execution of contract.

6.4.2 Within ten (10) days of receipt of the Form and Conditions of Contract the successful bidder will be required to sign the Contract and return it to OGDCL.

6.5 **Performance Bond**

6.5.1 Within Fifteen (15) days of the receipt of notification of intent to award the Contract from OGDCL, the successful bidder shall furnish a Performance Bond in the Form of Bank Guarantee (**Annexure – II**) for an amount of ten percent (10%) of the Supply & Services Price as a guarantee for the due and faithful performance of the Contract. The said Performance Bond shall be valid up to twelve (12) months from the successful commissioning of Power Generation System & Allied Equipment or twenty four (24) months from the date of unloading of last consignment of Generation System at Karachi Sea Port. The performance Bond shall be issued by following banks. List of OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI** of Tender Document.

6.5.2 Failure of the successful Bidder to comply with the requirements of Instruction 6.4 or 6.5 shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Bond, in which event OGDCL may make the award to the next lowest evaluated Bidder or call for new Bids.

Note: Guarantee from Royal Bank of Scotland (RBS)/NIB Bank / Summit Bank is not acceptable.

ANNEXURE – I
BID PRICE SCHEDULE

ANNEXURE-IOIL & GAS DEVELOPMENT COMPANY LTD.BID PRICE SCHEDULE FOR SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM AND ALLIED EQUIPMENTS

(To be Submitted with Financial Bid)

ITEM	MATERIAL DESIGNATION	QTY.	UNIT PRICE (FOB) BY SEA	TOTAL PRICE (FOB) BY SEA	UNIT PRICE CFR (C&F) BY SEA	TOTAL PRICE CFR (C&F) BY SEA
A	SUPPLY OF POWER GENERATION SYSTEM AND ALLIED EQUIPMENT (INCLUDING GENERATORS, SYNCHRONIZATION, SWITCHGEAR, FUEL GAS CONDITIONING ETC) COMPLETE IN ALL RESPECT AS PER SCOPE OF WORK AND TENDER DOCUMENTS	1 LOT.				
B	SUPPLY OF START-UP & COMMISSIONING SPARES	1 LOT				
	Item - wise details with QTY and price to be provided					
C	SUPPLY OF TWO YEARS RECOMMENDED SPARE PARTS	1 LOT				
	Item - wise details with QTY and price to be provided					
D	EXPENSES ON SHOP WITNESS TESTING FAT FOR OGDCL RESPRESENTATIVES	1 L.S JOB				
E	PRE-COMMISSIONING COMMISSIONING & PERFORMANCE TESTING CHARGES Note: (4)	1 L.S JOB				
F	INSTALLATION EXPERT CHARGES Note: (3)	1 L.S JOB				
G	ON-SITE TRAINING SERVICES FOR OGDCL STAFF FOR FIVE (05) DAYS	1 L.S JOB				
	TOTAL (A to G)					

NOTE:

(1)-Financial Evaluation shall include items at serial No.(A+B+D+E+F+G) to determine to lowest evaluated bidder. Two years recommended spares parts (Item No.C) shall not be part of financial evaluation

(2)- Third Party Inspection Agency (TPI) shall be arranged by OGDCL.

(3)- The estimated Mandays and rates of each member of pre-commissioning, commissioning start-up & testing team shall be submitted.

(4)- The estimated Mandays and rates of each member of installation experts team shall be submitted.

ANNEXURE – II

PERFORMANCE BANK GUARANTEE FORMAT

ANNEXURE – II**PERFORMANCE BANK GUARANTEE**

Oil & Gas Development Company Limited
 First Floor, OGDCL House,
 Jinnah Avenue, Blue Area,
 Islamabad (Pakistan).

Dear Sirs,

Ref; our Bank Guarantee No. _____ in the sum
 of _____ Account _____ In consideration of you having
 entered into Contract No. _____ Dated _____ with
 _____ Called Bidder and in consideration for value received from Bidder. We hereby agree
 and undertake as followings:

1. To make unconditional payment to you as called upon of (10%) ten percent of the value of the contract price mentioned in the said contract, on your written FIRST and SIMPLE demand without further recourse, question or reference to Bidder or any other person in the event of default, non-performance or non-fulfillment by Bidder of his obligations, liabilities, responsibilities under the said contract of which you shall be the sole judge.
2. To accept written intimation from you as conclusive and sufficient evidence of the existence of the default or breach as aforesaid on the part of Bidder and to make payment immediately and forthwith upon receipt of your FIRST and SIMPLE written demand.
3. This Performance Bond shall remain valid and in full force and effect upto _____ or issue of statement of discharge by your authorized representative or return of original guarantee whichever is earlier.
4. DEMURRAGE DUE TO DELAY IN RECEIPT / NEGOTIATION OF ORIGINAL SHIPPING DOCUMENTS.

If clean documents are not negotiated within Negotiation Period allowed in Letter of Credit or documents are with held by Bank on account of any discrepancy:

- ✓ If the Demurrage; if any incurred due to late negotiation of the Clean Documents and paid by OGDCL will be realized from the beneficiary of L/C, by encashing this Performance Bond to the extent of demurrage amount. In case demurrage amount exceeds the total value of this Performance Bond the balance amount will be payable by the beneficiary.

- That no grant of time or other indulgence to, amendment in the terms of the Contract by Agreement between the parties, or imposition or Agreement with Bidder in respect of the performance of his obligations under the said Agreement, with or without notice to us, shall in any manner discharge or otherwise affect this Guarantee and our liabilities and commitments there under.
6. This is an independent and direct obligation guarantee and shall be binding on us and our successors interest and shall be irrevocable.
 7. This guarantee shall not be affected by any change in the constitution of the Guarantor Bank or the constitution of the Bidder.
 8. The Guarantor Bank Warrants and represents that it is fully authorized, empowered and competent to issue this guarantee.

(BANKERS)

Note: Guarantee from Royal Bank of Scotland (RBS)/NIB Bank / Summit Bank is not acceptable. List of Approved Banks for Bank Guarantee is given in Annexure-XVI.

SHEET 1 OF 2

ANNEXURE – III

FORMAT OF RESPONSIBILITY MATRIX

ANNEXURE-III

FORMAT OF RESPONSIBILITY MATRIX

S. No.	Name of JV Partner	Nature of Involvement & Responsibilities

ANNEXURE – IV
FORMAT OF BID BOND

ANNEXURE – IV**BID BOND****(To be submitted with Technical Bid)**

Oil & Gas Development Company Limited,
OGDCL House,
Jinnah Avenue, Blue Area,
Islamabad.

Dear Sir,

In consideration of M/S _____ herein after called “THE

BIDDER” having submitted the accompanying Bid with reference to OGDCL tender enquiry No. PROC-FC/CB/PROJ/MELA-4064/2018 and in consideration of value received from (the Bidder above), we hereby agree to undertake as follows:-

1. To make unconditional, immediate and forthwith payment of the sum of US\$ (United States Dollars 25,000(Twenty Five Thousand Dollars or equivalent of Pak Rupees _____ (_____Pak Rupees only) upon your FIRST and SIMPLE written demand without further recourse, question, query, deferment, contestation or reference to the bidder, account party or any other person in the event of the withdrawal of the aforesaid bid by the BIDDER before the end of the period specified in the Bid after the opening of the same for the validity thereof or if no such period be specified, within **210 Days** after the said opening or if the Bidder, having been notified of the acceptance of his bid by the Company during the period of bid validity:
 - a) Fails, refuses or delays to execute the Contract in accordance with the instruction to Bidders,
Or
 - b) Fails, refuses or delays to furnish Performance Bond in accordance with the instruction to Bidders.
Or
 - c) Submit forged / fake document(s) in support of their bid
2. To accept written demand from you as conclusive, sufficient and final evidence of the existence of a default of non-compliance, breach or default as aforesaid on the part of the BIDDER and to make payment immediately and forthwith upon receipt of your FIRST and SIMPLE written demand.
3. No grant of time or other indulgence to, or composition or arrangement with the BIDDER in respect of the aforesaid Bid with or without notice to us shall affect this Guarantee and our liabilities and commitments hereunder.
4. This is an independent and direct obligations guarantee and shall be binding on us and our successor in-interest and shall be irrevocable.
5. The Guarantor Bank warrants and represents that it is fully authorized, empowered and competent to issue this guarantee.

Yours faithfully,

(BANKERS)

Note: Guarantee from Royal Bank of Scotland (RBS)/NIB Bank / Summit Bank is not acceptable. List of Approved Banks for Bank Guarantee is given in Annexure-XVI.

ANNEXURE – V

SUPPLIER / PACKAGER / MANUFACTURER PROFILE

ANNEXURE – V**SUPPLIER / PACKAGER / MANUFACTURER PROFILE**

The supplier / packager / manufacturer and partners / members of joint venture / consortium are required to provide the information / details given in this document separately.

- 1) Name of Company (including Fax, Telephone, email, website) complete address of the corporate / Head Office as well as office dealing with sales to Pakistan and adjoining region.
- 2) Certified copy of Certificate of incorporation (in case of companies) or Registration Certificate (in case of firms).
- 3) Details of company's core business.
- 4) Manufacturing capacity of Generation System and allied equipment package (of the type/range) required by OGDCL with list of customers / buyers.
- 5) Production / sales of Power Generation System (of the type range) required by OGDCL during last ten (10) years.
- 6) Certified copies of financial statements / annual reports for the last three (03) years (for companies & firms) or certified copies of Tax Returns for the last three (03) years of local individuals.
- 7) Certified copies for statement of Bank Accounts for the last twelve (12) months containing name, phone no. of Bank Manager.
- 8) Valid National Tax No. (NTN) and GST Registration Certificate (for local bidder).
- 9) Litigation Details (if any) with customers during last ten (10) years.

ANNEXURE – VI

**DETAILS OF SIMILAR POWER GENERATION SYSTEM
PACKAGE SUPPLIED & COMMISSIONED DURING LAST
TEN (10) YEARS**

ANNEXURE-VI**DETAILS OF SIMILAR POWER GENERATION SYSTEM PACKAGE SUPPLIED & COMMISSIONED DURING LAST TEN (10) YEARS**

Sr. No.	Name & Address (Including Phone, Fax, email) of Buyer	Country	Details & Description of Supplied Equipment						Details & Description of Scope of Supply & Responsibilities	Details of Technical Back-up Support Provided
			Qty	Year Of Supply	Type of Generator	Generator Ratings	Generator Manufacturer	Commissioning YES / NO		

(* Please list country of origin (home country) orders first followed by Pakistan and other countries.

NOTE:

Please also provide a list of current orders for Supply & Commissioning of Generation System on the above pattern.

ANNEXURE – VII

**FORMAT OF CURRICULUM VITAE (CV) OF NOMINATED
KEY PERSONNEL, COMMISSIONING PERSONNEL AND
INSTALLATION EXPERTS**

ANNEXURE – VII**POWER GENERATION SYSTEM & ALLIED EQUIPMENT PACKAGE****Format of Curriculum Vitae (CV) of Nominated Key Personnel,
Commissioning Personnel and Installation Experts**

Proposed Position: _____

Name of Firm: _____

Name of Staff: _____

Profession: _____

Date of Birth: _____

Years with Firm: _____ Nationality: _____

Membership in Professional Societies: _____

Nominated Position & Tasks Assigned: _____

Key Qualifications:

[Give an outline of staff member's experience and training most pertinent to Design, supply, installation, testing and commissioning of Generation System. Also describe *degree of responsibility held* by staff member.]

Education:

[Summarize college/university and other specialized education of staff member, giving names of schools, dates attended and degrees obtained. Use up to a quarter page.]

Employment Record:

[Starting with present position, list in reverse order every employment held. List all positions held by staff member since graduation, giving dates, names of employing organization, title of positions held and location of assignments. For experience in *last ten years*, also give types of activities performed and client references, where appropriate. Use up to three-quarters of a page.]

Languages:

[Indicate proficiency in speaking, reading and writing of each language: excellent, good, fair, or poor.]

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, these bio-data correctly describe myself, my qualifications and my experience.

Signature of Staff Member or authorized official of Manufacturer/Authorized Distributor

Date: _____
Day/Month/Yr

ANNEXURE – VIII-A & B

INTEGRITY AND ETHICS UNDERTAKING

ANNEXURE-VIII-A

(On official letter-head of the bidder)
To be signed by the
Chief Executive of the
bidding company or a representative duly
authorized by abroad resolution.

Integrity and Ethics Undertaking

We hereby commit and undertake to observe the following principles during our participation in the tender process and during the contract execution:

- a) That we will not directly or through any other person or firm, offer promise or give to any of the employees of OGDCL involved in the tender process or execution of the contract any gain, pecuniary benefit or facilitation payment in order to obtain in exchange any advantage of any kind whatsoever during the process or during the execution of contract.
- b) That we have not and will not enter with other bidders into any undisclosed agreement or understanding either formal or informal to restrict competitiveness or to cartelise in the bidding process.
- c) That we will ensure that the remuneration of agents (if engaged) is appropriate and for legitimate service only.
- d) That we will not use subcontracts, purchase orders or consulting agreements as means of channeling payments to employees of OGDCL.
- e) That we will not commit any offence under the Pakistan Panel Code, Prevention of Corruption Act or National Accountability Ordinance to achieve any exchange, gain or benefit during the tender process or the execution of contract.

We further understand and acknowledge that any violation or transgression of the above mentioned principles will attract disqualification from the tender process and may also result in permanent exclusion from further contract award processes.

We also accept and understand to respect and uphold OGDCL's absolute right to resort to and impose such disqualification, debarment or execution.

For and on behalf of _____

Tender No. _____

ANNEXURE-VIII-B

(On official letter-head of the bidder)
To be signed by the
Chief Executive of the
bidding company or a representative duly
authorized by abroad resolution.

Integrity and Ethics Undertaking

We hereby commit and undertake to observe the following principles during our participation in the contract execution.

- a) That we will not directly or through any other person or firm, offer promise or give to any of the employees of OGDCL involved in or relevant to the execution of the contract any gain, pecuniary benefit or facilitation payment in order to obtain in exchange any advantage of any kind whatsoever during the execution of contract or at any stage thereafter.
- b) That we did not enter with any bidder into any undisclosed agreement or understanding either formal or informal to restrict competitiveness or to cartelise in the bidding process.
- c) That we will ensure that the remuneration of agents (if engaged) is appropriate and for legitimate services only.
- d) That we will not use subcontracts, purchase orders or consulting agreements as means of channeling payments to employees of OGDCL.
- e) That we will not and have not committed any offence under the Pakistan Panel Code, Prevention of Corruption Act or National Accountability Ordinance to achieve any advantage, gain or benefit during the tender process or the execution of contract.

We further understand and acknowledge that any violation or transgression of the above mentioned principles will attract disqualification from doing business with OGDCL and may also result in permanent exclusion from further contract award processes.

We also accept and understand to respect and uphold OGDCL's absolute right to resort to and impose such disqualification, debarment or execution.

For and on behalf of _____

Tender No. _____

Contract No. _____

ANNEXURE – IX

DATA SUMMARY SHEET (TECHNICAL)

ANNEXURE – IX

DATA SUMMARY SHEET

(To be submitted with Technical Bid)

Following information regarding Power Generation System & Allied Equipment Package being procured must be stated categorically:

NAME AND ADDRESS OF MANUFACTURER

COMPLETE NAME AND ADDRESS OF BIDDER L/C
BENEFICIARY

COUNTRY OF ORIGIN

PORT OF SHIPMENT/DESTINATION

VALIDITY OF BID

DELIVERY PERIOD

AMOUNT OF BID BOND

ADDRESS OF BANKER WITH ACCOUNT NO.

NAME AND ADDRESS OF LOCAL AGENT
IN PAKISTAN (IF ANY)

CONFIRMATION THAT QUOTED PRICED IS FIRMED/FIXED AND NOT BASED ON ANY PRICE ADJUSTABLE
FORMULA/ANY ESCALATION YES
NO

CHECK LIST:

1 HAVE YOU COMPLETED THE BID PRICE SCHEDULE YES NO

Sign & Seal

ANNEXURE – X

**COMPOSITION OF COMMISSIONING TEAM AND
DETAILS OF TASK ASSIGNED & RESPONSIBILITIES**

ANNEXURE – X**POWER GENERATION SYSTEM & ALLIED EQUIPMENT PACKAGE****Composition of Commissioning Team and Details of Task Assigned & Responsibilities****1. Technical/Managerial**

Name	Position	Task To be Assigned & Responsibilities

2. Support Staff

Name	Position	Task To be Assigned & Responsibilities

ANNEXURE – XI
BIDDING FORM FORMAT

ANNEXURE – XI**BIDDING FORM**
(To be typed on Bidder's Letterhead)

Dated: _____

Tender Enquiry No.._____

To, Oil & Gas Development Company Limited OGDCL House,
Jinnah Avenue, Blue Area, Islamabad, Pakistan.

Gentlemen,

1. Having Examined the bidding document comprising of:

VOLUME - I

- I) Introduction
- II) Invitation to Bid
- III) Instruction to Bidders
- IV) Forms & Conditions of Contract

VOLUME - II

- V) Scope of Supply & Specification and Preferred Vendor List.

VOLUME - III

- ✓ Specifications, Data Sheets and Drawings.

,the receipt of which is here acknowledged, we the undersigned, offer to supply & deliver _____ (description of goods/ works) _____ in conformity with the requirement of above documents for the sum of _____ (total bid amount in words and figures) _____ or such other sums as may be ascertained in accordance with the said

conditions and 'Price Schedule' attached herewith and made part of this bid.

- 2. If our Bid is accepted we shall commence delivery within _____ days and Completed delivery of all the items specified in the Contract within _____ days from the date of receipt of your Letter of Credit.
- 3. If our bid is accepted, we shall obtain the Guarantee of a scheduled Bank or other sureties (to be approved by you) to be jointly and severally bound with us in a sum not exceeding ten percent (10%) of the Contract sum for due performance of the Contract as per format at **Annexure-II**.

- 4. We agree to abide by this bid for the period of One hundred and eighty days (180) from the date fixed for opening the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- 5. We agree to submit the Bid Bond for an amount equivalent to _____ along with the Technical Bid.
- 6. Until a formal Agreement is prepared and executed, this Bid, together with your acceptance thereof, shall constitute a binding Contract between us.
- 7. We understand that you are not bound to accept the lowest or any bid you may receive.
- 8. We accept the other terms & conditions of L/C enclosed as **Annexure-XV-A**.

Dated this _____ day of _____

Signature _____ in the Capacity of

_____ Duly authorized to sign
Tenders for and on behalf of (Name of the firm in block capitals) Address

Fax _____ Telephone _____ Signature

Witness: - 1. _____ 2. _____

ANNEXURE – XII

DATA SUMMARY SHEET (FINANCIAL)

ANNEXURE – XII

DATA SUMMARY SHEET

(To be submitted with Financial Bid)

Following information regarding Power Generation System & Allied Equipment Package being procured must be stated categorically:

NAME AND ADDRESS OF MANUFACTURER

COMPLETE NAME AND ADDRESS OF BIDDER L/C BENEFICIARY

COUNTRY OF ORIGIN

PORT OF SHIPMENT/DESTINATION

VALIDITY OF BID

DELIVERY PERIOD

CURRENCY BID

AMOUNT OF BID BOND

ADDRESS OF BANKER WITH ACCOUNT NO.

NAME AND ADDRESS OF LOCAL AGENT IN PAKISTAN (IF ANY)

CONFIRMATION THAT QUOTED PRICED IS FIRMED/FIXED AND NOT BASED ON ANY PRICE ADJUSTABLE FORMULA/ANY ESCALATION
YES
NO

CHECK LIST:

1	HAVE YOU COMPLETED THE BID PRICE SCHEDULE	YES	NO
---	---	-----	----

Sign & Seal

FILE: Annexure-XIII

SHEET 1 OF 1

ANNEXURE – XIV-A

TERMS & CONDITIONS OF L/C FOR SUPPLY

ANNEXURE – XIV-A**TERMS AND CONDITIONS OF THE L/C FOR SUPPLY**
(TO BE STRICTLY COMPLIED BY THE BENEFICIARY)

(For CFR by Sea / Air Basis)

1.0 CONSIGNEE

The material must be consigned to LC Opening Bank.

Notify Party

Oil & Gas Development Company Limited, Plot No.21, West Wharf Road, Karachi.
Telephone No. 021-32313119-23. Fax No. 021-32311040 E-mail abdulwaheed_kunbhar@ogdcl.com

2.0 PACKING

The Packing of the material must conform to the International Standards (for Sea worthy packing).

3.0 MARKING

3.1 All Packages/Boxes must bear the Contract No. as shipping Marks, Country of Origin and Weight in Kilograms (Gross/Net). The marks must tally with shipping documents like B/L and manifest there should not be any difference.

3.2 In addition to the above mentioned shipping marks, the following procedure of color code marking to be adopted / made on each side of the package/box/container while dispatching the material:-

“There will be an isosceles triangle with or less than six inches side, triangle and letters will be in black. On bid packages/boxes/container, the sides or triangle and letters will be increased appropriately. Underneath the triangle there will be two color code bars in “GREEN” color size six inches in height and 1 ½” in width. If the above color codes making is not appropriate/suitable, the sizes and color may be changed.”

4.0 SHIPPING DOCUMENTS

Shipping documents (in English Language) shall normally consist of the following:

4.1 Master Bill of Lading / Airway Bill (only Master Bill of Lading signed by the carrier or their authorized agent showing clean shipped on board is acceptable).

4.2 Detailed invoice showing commodity description, quantity, unit/total price, total

No. of packages, etc containing original signatures.

- 4.3 Packing List, (Showing total number of packages, gross/net weights & measurement and Box No. in case of more than one boxes such as Box No. 1/10, 2/1010/10 and so on and details of material in each box.
- 4.4 Certificate of origin (signed and stamped by the manufacturer).
- 4.5 Mill Test Certificates/ Inspection Certificates / Quality Certificates (signed and stamped by the manufacturer).
- 4.6 FAT Report (if required) / Shop Witness Test Report.
- 4.7 Pre-shipment Inspection Certificate issued by 3rd party inspector (appointed by OGDCL)
- 4.8 Certificate of compliance certifying that the packages / systems supplied conform to the Contract specification and are brand new.
- 4.9 Marine Insurance Declaration i.e. a copy of the Fax sent to M/s National Insurance Company Limited (NICL), Fax No. 0092-21-99202734.
- 4.10 Warranty/guarantee certificate from the beneficiary showing guarantee for twelve (12) months from the date of issuance of Acceptance Certificate by OGDCL.
- 4.11 Certificate of compliance certifying that Parts Catalogue, Operational Manual Brochures and Technical Literature of the material have been couriered to Manager (Projects) OGDCL, Islamabad and also in soft form on CD(s).
- 4.12 A copy of the Fax / email sent for the shipment intimation.

5.0 **SHIPMENT INTIMATION**

The beneficiary within 24-48 hours of making shipment must sent fax OR E-mail to (1) Chief Material Officer, Plot No. 21, West Wharf, Karachi, Fax No. 0092-21-2311040, E-mail: mujahid_ali@ogdcl.com (2) Manager (Foreign) Procurement, OGDC House Plot No. 3 (New NO. 3013) F-6/G6, Blue Area, Jinnah Avenue, Islamabad. Fax No. 0092-51-9244210 & 0092-051-9209803-7, E-mail: ejaz_rizvi@ogdcl.com (3) Chief Accountant (Imports) on Fax No. 0092-51-9209803-7, E-mail: farooq_salim@ogdcl.com ” (4) National Insurance Company Limited, Karachi on FAX No. 0092-21-99202734 or E-mail: ‘sanauallah.shaikh@nicl.com.pk’ or gulam.akbar@nicl.com.pk, or info@nicl.com.pkintimating them the following: -

- a) L/C number and Contract No.
- b) Name of the Ship and Shipping line.
- c) Bill of Lading / Airway Bill No. and Date
- d) Total CFR value of the consignment shipped.

- e) Port of shipment.
- f) No. of boxes/package/pieces etc.
- g) Net and gross weights.
- h) Expected time of arrival (ETA) of ship.

6.0 **INSTRUCTIONS FOR COMPLETING SHIPPING DOCUMENTS**

6.1 The shipping invoice should be marked on top in capital words.

- a) The shipping invoice should be marked on top in capital words.
- a) Name of the system / package being shipped
- b) Partial shipment of a system / Package is not acceptable. More than one complete system / Package may be shipped in one consignment

6.2 All invoices should be manually signed, and must indicate value of the each item and total value.

7.0 **INSTRUCTION REGARDING NEGOTIATION / TRANSMISSION OF SHIPPING DOCUMENTS**

7.1 **Original Negotiable Documents**

- a) The beneficiary upon making shipment(s) should negotiate the clean shipping documents free from any discrepancy with negotiating bank within negotiation period.
- b) If the documents are withheld by the Bank on account of any discrepancy whatsoever the demurrage or financial impact if any incurred will be on beneficiary's account and will be realized directly by raising invoice, and / or by deducting the amount from the L/C value and /or by encashing Performance Bond (if provided) to the extent of demurrage amount. In case the demurrage amount exceeds the value of Performance Bond the balance amount will be recovered from the beneficiary
- c) Original negotiable documents must contain at least four sets of the shipping documents.
- d) The original shipping documents should be dispatched through courier service by the negotiating bank at the beneficiary's cost within 2-3 working days after receipt from the beneficiary.

- e) The acceptance of discrepant documents shall be subject to the approval of OGDCL. However, demurrage; if any, accrued remains the sole responsibility of the beneficiary.

7.2 **Non-Negotiable Documents**

- a) Complete sets of non-negotiable shipping documents in English language (i.e. bill of lading, packing list, invoice etc.) including parts catalogue brochures/technical literature should be dispatched through courier service by beneficiary within 2-3 working days after making shipment to the following:

1. MANAGER (SCM) - FOREIGN (4 Complete Sets)
OIL & GAS DEVELOPMENT COMPANY LIMITED
OGDCL HOUSE, PLOT NO 3 (New No. 3013)
F-6/G6, BLUE AREA, JINNAH AVENUE
ISLAMABAD (PAKISTAN)
PHONE NO: 0092-51-9207461, 920023780
FAX NO: 0092-51-9207530, 9209673
E-mail: ejaz_rizvi@ogdcl.com
2. CHIEF MATERIAL MANAGEMENT OFFICER (2 Complete Sets)
OIL & GAS DEVELOPMENT COMPANY LIMITED
PLOT NO.21. WEST WHARF ROAD,
KARACHI (PAKISTAN).
PHONE NO. 021 -32313119-23
FAX NO: 0092-51-2311040
E-mail: abdulwaheed_kunbhar@ogdcl.com

- b) The non-negotiable shipping documents should be couriered at the shippers cost and responsibility not exceeding 2 working days after making shipment.

8.0 **INSURANCE**

Insurance from port of shipment/delivery will be covered by openers and declaration shall be made by the beneficiary to Insurance Company i.e. M/S National Insurance Company Limited, NICL Building, South Zone, Abbasi Shaheed Road, off Shakra-e-Faisal Road, Karachi (Pakistan). Fax No. 0092-21-99202734 or E-mail: "sanaullah.shaikh@nicl.com.pk" OR gulam.akbar@nicl.com.pk, OR info@nicl.com.pk and Chief Accountant (Imports)/OGDC LTD., Fax No. 0092-51-9209803-07 or E-mail: farooq_salim@ogdcl.com@ogdcl.com" immediately after shipment giving full details of shipment e.g. value of shipment description of material, name of vessel, B/L with date, port of shipment, contract and Letter of Credit Numbers.

9.0 **TRANS-SHIPMENT AND SHIPPING LINES AGENTS**

Transshipment is totally prohibited under the L/C.

10.0 LIQUIDATED DAMAGES

- a. Subject to clause 30 of these conditions of Contract “General”, If the Supplier /Manufacturer/Packager fails to deliver any or all of the goods within the time period(s) specified in the Contract, the OGDCL shall, without prejudice to other remedies under the contract, deduct from the contract price / Bank Guarantee as liquidated damages, a sum not more than 0.5% of the contract price per week or part thereof for first four weeks, 1.00% per week for next four weeks and 1.5% per week exceeding four weeks up to maximum extent of 10% of the contract value.
- b. In case the OGDCL is satisfied that the delayed / defective shipment was due to some mistake or circumstances beyond the control of the Manufacturer/Packager and the Manufacturer/Packager has not intentionally or negligently contributed in the delay, the OGDCL may impose Liquidated Damages for not more than a sum equivalent to 0.5% of the delayed or defective shipment per week or part thereof for first two weeks, 1.00 % per week for next three weeks and 1.5% per week exceeding five weeks but not exceeding 10% of the contract value of the delayed/ defective shipment provided that the Manufacturer/Packager takes immediate remedial measures for the-replacement of defective shipment and takes prompt steps to mitigate the delay. The OGDCL may however, impose Liquidated Damages as per (a) above if the delayed or defective shipment has affected the project completion schedule or has resulted in production losses.
- c. Even after imposition of LDs, if the Manufacturer fails to materialize the delivery (material and or services); the OGDCL reserves the right to cancel Contract/LC and to forfeit the Guarantee (if applicable) after intimating the Manufacturer for such cancellation/forfeiture.

11.0 AMENDMENT/EXTENSION OF L/C

The beneficiary will positively confirm shipment of all ordered materials within L/C validity or made request for extension of shipment and negotiation dates at least 15 to 30 days prior to the expiry of L/C. If shipment is not effected within L/C validity or request for extension is not received 15 to 30 days prior to expiry of L/C validity, no request for grant of extension in shipment and negotiation period will be entertained under any circumstances. In case of extension in shipment/negotiation period, the beneficiary will be required to extend the validity of his Performance bond (if provided) accordingly. All charges on this account will be on beneficiary's account.

12.0 **CHARGES FOR L/C ESTABLISHMENT**

13.1 All Charges of the bank for credit opening will be borne by the OGDCL.

13.2 All charges of corresponding bank such as negotiation of documents, adding confirmation to credit etc. will be to the account of beneficiary.

13.3 All charges for amendments/extension in L/C will be to the account of beneficiary.

13.0 **TAXES**

Deduction of Income Taxes shall be made as per Government of Pakistan Rules and Regulations.

ANNEXURE – XIV-B

TERMS & CONDITIONS OF L/C FOR SERVICES

ANNEXURE-XIV-B

TERMS AND CONDITIONS & FORMAT OF L/C FOR SERVICES

1. **FORM OF DOCUMENTARY CREDIT**
Irrevocable
2. **DOCUMENTARY CREDIT NUMBER**

3. **DATE OF ISSUE**

4. **DATE AND PLACE OF EXPIRY**

5. **APPLICANT BANK – NAME & ADDRESS**
6. **APPLICANT**
7. **BENEFICIARY – NAME & ADDRESS**
8. **CURRENCY CODE, AMOUNT**
9. **AVAILABLE WITH...BY.....NAME & ADD.**
*Any First Class Bank in the Country
of Beneficiary by Negotiation*

10. **DRAFTS AT.....**11. **DOCUMENTS REQUIRED**

Payment against the letter of credit shall be effective upon submission of following clean documents:

– **Supervision Services during Erection/Installation**

The charges of expert involved in providing supervision services during erection/installation of Power Generation System & Allied Equipment Package shall be paid (on manday basis) in forty Five (45) days of successful completion of services and submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the services have been provided as per OGDCL's requirement.

– **Pre-Commissioning, Commissioning & Start-Up, Performance Testing Charges**

The charges for Pre-Commissioning, Commissioning and Start-Up, performance testing of Power Generation System & Allied Equipments shall be paid by OGDCL (on manday basis) in thirty (30) days of successful commissioning on submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the Power Generation System & Allied Equipment has been successfully commissioned.

– **Training at Site**

The charges for providing training to OGDCL personnel at Project Site shall be paid by OGDCL (on manday basis) within thirty (30) days of successful completion of training program against Manufacturer/Packagers original invoice duly verified by OGDCL.

12. **DRAWEE – NAME & ADDRESS**

13. **ADDITIONAL CONDITIONS**

- 1) All documents to show L/C number
- 2) LC represents 100 percent CFR value that is _____.
- 3) The amount of negotiation should not exceed the LC value
- 4) The negotiating bank must endorse the amount of negotiation on the reverse of the original letter of credit.

14. **CHARGES**

The Bank charges for establishment of L/C, additional confirmation and any subsequent amendments in L/C will be borne as follows:

- a) All charges for L/C opening inside of Pakistan will be borne by OGDCL.
- b) All charges for L/C outside Pakistan and confirmation will be to the beneficiary's account including advising commission, taxes, postage, telex charges and reimbursement commission etc.

15. **PERIOD FOR PRESENTATION**

Documents to be presented and negotiated within fifteen (15) days from the date of issuance of Documents but within the validity of this Credit.

16. **CONFIRMATION INSTRUCTIONS**

Reimbursing Bank

1. The amount _____ with the reimbursing Bank
if the documents are in Strict Compliance of the L/C Terms.
2. Please send the original set of documents direct to us _____
followed by duplicate set.
3. Please do not negotiate the documents under reserve or against guarantee.

17. **SENDER TO RECEIVER INFORMATION**

*This credit is subject to inform Custom and Practice for
Documentary Credits (2007) Revision
ICC Publication No.600*

18. **TAXES**

Deduction of Income Taxes shall be made as per Government of Pakistan Rules and Regulation

ANNEXURE – XVI

LIST OF APPROVED BANKS

Oil & Gas Development Company Limited
List of Banks allowed for Bank Guarantees

Sr. No.	Bank Name
1	ALLIED BANK
2	ASKARI BANK
3	BANK AL HABIB
4	BANK ALFALAH LTD
5	FAYSAL BANK
6	HABIB BANK LTD
7	HABIB METROPOLITAN BANK
8	MEEZAN BANK LIMITED
9	MCB BANK
10	NATIONAL BANK OF PAKISTAN
11	STANDARD CHARTERED BANK
12	UNITED BANK LTD

**Zishan Engineers (Pvt.) Ltd.****An ISO 9001-2015 certified company,**

47/F, Block 6, PECHS, Karachi-Pakistan
Tel: (92-21) 34393045-48 & 34310151-54
Fax: (92-21) 34533430 & 34310156
E-mail : contact@zishanengineers.com,
Web : www.zishanengineers.com

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Revision	D
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Total Pages (inc front cover)	31

**OIL & GAS DEVELOPMENT COMPANY LTD.****TENDER NO.****SUPPLY & COMMISSIONING OF POWER GENERATION
SYSTEM & ALLIED EQUIPMENT PACKAGE****(SECTION – IV)****FORM & CONDITIONS OF CONTRACT**

D	15-05-2019	Re-Issued for Approval	HH	SP	SP
C	14-05-2019	Re-Issued for Approval	HH	SP	SP
B	08-05-2019	Re-Issued for Approval	HH	SP	SP
A	09-04-2019	Issued for Approval	HH	SP	SP
Rev.	Date	Description	Prepared By	Checked By	Approved By

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2.0	CONDITIONS OF CONTRACT	07

ATTACHMENT:

ATTACHMENT-I: PROVISIONAL ACCEPTANCE CERTIFICATE

FORM OF CONTRACT

This Contract (hereinafter referred to as “Contract”) is made this ____ day of _____ 2019 between Oil & Gas Development Company Limited having its Head Office situated at OGDCL House, Jinnah Avenue, Islamabad (hereinafter referred to as “OGDCL”, which expression where the context admits shall include and mean its successors in interest and assigns) of the one Part and M/s. _____ having its registered office at _____

(hereinafter referred to as “Supplier/Manufacturer/Packager” which expression whereas the context admits shall include and mean its successors and assigns) of the other part.

WHEREAS OGDCL invited Bids for Supply & Commissioning of Power Generation System & Allied Equipment Package at Mela Field

AND WHEREAS the Supplier/Manufacturer/Packager after reviewing the available documents/drawings, and understanding the complete details and requirements of the Supply & Commissioning of Power Generation System & Allied Equipment as mentioned in OGDCL’s Tender Document No. _____ dated _____ 2019, submitted the Bid No. _____ dated _____ 2019 and has agreed to supply & commission of Power

Generation System & Allied Equipment Package as per terms, conditions and specifications mentioned hereinafter.

WHEREAS the Supplier/Manufacturer/Packager represents and warrants to OGDCL that it is fully qualified, experienced and professionally competent and possess the necessary skills and resources and is able and willing to supply and fabricate the required Power Generation System & Allied Equipment Package mentioned earlier, strictly so as to achieve the objective of the Contract.

WHEREAS OGDCL through letter no. _____ dated _____ communicated its intention to award the Contract for supply & commissioning of Power Generation System & Allied Equipment Package required to be installed at one of its facility.

NOW THEREFORE IN CONSIDERATION OF THE ABOVE PREMISES AND THE MUTUAL COVENANTS HEREINAFTER STIPULATED THE PARTIES AGREE AS FOLLOWS:

1.0 CONTRACT & ITS OBJECT

In this Contract, words and expressions shall have the same meanings as are respectively assigned to them in the conditions of the Contract hereinafter referenced.

The following documents (hereinafter called “the Contract Documents”) comprise the entire Contract between the parties and supersede and replace any prior correspondence, agreement or understanding between the parties:

- | | | | |
|----|--|---|---------------------|
| a) | This Contract | | |
| b) | Conditions of Contract | : | Appendix – A |
| c) | Tender Document (Including Technical Specifications, Scope of Supply & Commissioning and Technical Details / Drawings) | : | Appendix – B |
| d) | Price Schedules | : | Appendix – C |
| e) | Delivery Schedule | : | Appendix – D |
| f) | Notification of Intention to Award | : | Appendix – E |
| g) | Bidder’s Bid Proposal (Technical & Financial) | : | Appendix – F |
| h) | OGDCL & Bidders Correspondence | : | Appendix – G |
| j) | Performance Bond (Bank Guarantee) Format | : | Appendix – I |

In consideration of the payments to be made by the OGDCL to the Supplier/Manufacturer/Packager as hereinafter mentioned the Supplier/Manufacturer/Packager hereby covenants with OGDCL to undertake and complete the delivery & commissioning of Power Generation and Allied Equipment Package to be supplied & commissioned in conformity in all respects with the provisions of the Contract.

OGDCL hereby covenants to pay the Supplier/Manufacturer/Packager in consideration for supplying & commissioning the Power Generation and Allied Equipment Package as per provisions of the Contract an amount of US\$ or Yuan _____ at the times and in the manner prescribed in the conditions of contract.

The Supplier/Manufacturer/Packager shall deliver (supply) & commission the required Power Generation System and Allied Equipment Package as per Scope of Supply/BOQs & Specifications given in the Tender Document and other relevant provisions of the Contract in _____ months at Karachi Sea Port from the date the Supply Letter of Credit is established. The commissioning of the Power Generation System and Allied Equipment Package shall be carried out by the Supplier/Manufacturer/Packager as per provisions of the Contract.

This Contract shall become effective upon the date after formal execution of the Contract by the duly authorized representatives of OGDCL and Supplier/Manufacturer/Packager provided that all of the following conditions have been fulfilled:

- a) The submission of the Performance Bond (Bank Guarantee) by the Supplier/Manufacturer/Packager to OGDCL as per OGDCL requirement.
- b) The Supply LC has been established.

After conditions specified above have been fulfilled and Supply LC has been established, the Supplier/Manufacturer/Packager shall diligently commence execution of the Contract forthwith and shall proceed with the same with due expedition and without delay in accordance with the terms of this Contract.

In WITNESS whereof the parties hereto have caused their respective Common Seals to be hereunto affixed (or have hereunto set their respective hands and seals) the day and year first above written.

SIGNED, SEALED AND DELIVERED

By the said (Signature & Stamp)

Name: _____

For and on behalf of the Oil & Gas
Development Company Limited (OGDCL)
in the presence of:

Name: _____

Address: _____

By the said (Signature & Stamp)

Name: _____

For and on behalf of the Supplier/
Manufacturer /Packager in the presence of:

Name: _____

Address: _____

CONDITIONS OF CONTRACT

1.0 GENERAL

These Conditions of Contract, together with the other parts of the Contract Documents shall apply to the Contract entered for Supply & Commissioning of Power Generation System & Allied Equipment Package. This Contract shall be drawn between Oil and Gas Development Company Limited (OGDCL) and the successful Bidder for the Facility. These “Conditions” of the Contract shall supersede any conditions made by the Supplier/Manufacturer/Packager, in his proposal unless such conditions have been specifically included in the Contract.

2.0 DEFINITION

In the Contract the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires:

- a) “Tender Documents” means the Document No: _____ issued by OGDCL for inviting Bids, which constitute the basis for bid proposals and the Contract.
- b) “Bid/Bid Proposal” means the offer of the successful Bidder to supply and commissioning of Power Generation System and Allied Equipment Package in response to the Bidding Documents
- c) The “Contract” means the agreement entered into between OGDCL and the Supplier/Manufacturer/Packager as recorded in the Contract Documents including all attachments and appendices thereto and all documents incorporated by reference therein
- d) “Contract Documents” means the documents forming the contract and shall include:
 - This Contract
 - Conditions of Contract : Appendix – A
 - Tender Document (Including Technical Specifications, Scope of Supply & Commissioning and Technical Details / Drawings) : Appendix – B
 - Price Schedule : Appendix – C
 - Delivery Schedule : Appendix – D

- Notification of Intention to Award : Appendix – E
- Bidder’s Bid Proposal (Technical & Financial) : Appendix – F

- OGDCL & Bidders Correspondence : Appendix – G
- Down Payment Guarantee Format : Appendix – H
- Performance Bond (Bank Guarantee) Format : Appendix – I

- e) “The Contract Price “means the price payable to the Supplier/Manufacturer/Packager under the Contract for the full and proper performance of his contractual obligations.
- f) “Goods” means all equipment, machinery, and/or materials which the Supplier/Manufacturer/Packager is required to supply to the OGDCL under this contract.
- g) “Supplier/Manufacturer/Packager” means the person or party who shall design, manufacture and supply & commission the Power Generation System & Allied Equipment Package
- h) “OGDCL/Owner/Company” means OIL & GAS DEVELOPMENT COMPANY LIMITED procuring the “goods” and “materials”.
- i) “Person” means firm, company, corporation or consortium.
- j) “Project/Facility” Gas processing facility.
- k) “Acceptance Certificate” means the Certificate to be issued by OGDCL confirming that Power Generation System & Allied Equipment Package have been supplied, commissioned and required tests performed.
- l) “Specification” or “Specified” shall mean the requirements of the documents.
- m) “Sub-Manufacturer” means the person or party to whom any part of the supply & commissioning work has or will be sublet by the Manufacturer with the written approval of OGDCL and includes his heirs, executors, administrators, representatives, successors, or assignees as approved by OGDCL.

- n) “Vendors” means any person or company having direct Contract with Manufacturer for supply of required components and other equipment or material required for the work under the contract.

- o) “Warranties” means all the warranties to be furnished or cause to be furnished by the Supplier/Manufacturer/Packager in favor of OGDCL under the contract.
- p) MOU (Memorandum of Understanding) means the formal contractual agreement entered into by the consortium partners for supply & commissioning of power generation system & allied equipment package for MELA Field including the responsibility matrix clearly elaborating lead partner and joint venture partner role (In case the bidder is a Joint Venture).

3.0 **SINGULAR AND PLURAL**

Words imparting the singular only also include the plural and vice versa where the context requires

4.0 **COMPLIANCE WITH BIDDING DOCUMENTS**

The supply, commissioning and testing of Power Generation System & Allied Equipment Package shall be completed in all respects and in strict accordance with the Contract Documents.

5.0 **COUNTRY OF ORIGIN**

- 5.1 All goods & material and ancillary services supplied under the Contract shall have their origin in the countries maintaining bilateral relations with Islamic Republic of Pakistan.
- 5.2 For purposes of this clause, “Origin” means the place where the goods were mined, grown or produced, or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized new product result which is substantially different in basic characteristics or in purpose or utility from its components.

6.0 **USE OF CONTRACT DOCUMENTS AND INFORMATION**

- 6.1 The Supplier/Manufacturer/Packager shall not, without OGDCL’s prior written consent, disclose the contents of Contract Documents, or any provision thereof, or any specification plan, drawing, pattern, sample or information furnished by or on behalf of the OGDCL in connection therewith, to any person other than a person employed by the Manufacturer/Packager in the performance of the Contract.

Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

- 6.2 The Supplier/Manufacturer/Packager shall not, without the OGDCL's prior consent, make use of any document or information enumerated in clause 6.1, except for purposes of performing the Contract.
- 6.3 Any document, other than the Contract itself, enumerated in clause 6.1 shall remain the property of the OGDCL and shall be returned (in all copies) to the OGDCL on completion of the Supplier/Manufacturer/Packager's performance under the Contract.

7.0 **SUFFICIENCY OF TENDER**

The Supplier/Manufacturer/Packager shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of the Tender and that the prices stated in the BOQ Prices schedule cover all his payment obligations under the Contract and all matters and things necessary for the proper performance of the Contract.

8.0 **INTERPRETATION**

- 8.1 Decision by the OGDCL shall be conclusive as to the true intent and meaning of drawings and technical specifications. Any discrepancy which may exist between drawings and the technical specifications shall be referred to the OGDCL, whose decision based on OGDCL approval as to the true meaning shall be final and binding for the Manufacturer.
- 8.2 The Manufacturer shall study and review the drawings, technical specifications and other information given to him by OGDCL. During this review, if it comes across any discrepancies, inconsistencies the same shall be reported in writing to the OGDCL.
- 8.3 All drawings and technical specifications, being instruments of services, are the property of OGDCL and shall be returned when the Work is completed.
- 8.4 Verbal instructions or information received from the OGDCL's office will not be recognized by him unless confirmed in writing.
- 8.5 The drawings and technical specifications are intended to be complementary to each other so that any items set-forth in either shall be recognized as if duly set-forth in both.

9.0 **ASSIGNMENT**

The Manufacturer/Supplier shall not assign the Contract or any part thereof, or any benefit or interest therein or there under without the prior written consent of OGDCL.

10.0 **STANDARDS**

The goods supplied under this Contract shall conform to the Standards mentioned in the technical specifications. In each case where reference is made to any specified National or International Standards. Other recognized and authoritative Standards ensuring equal or higher quality will also be acceptable. In case your offer conforms to Standards other than stipulated in the ITB you are required to submit along with your bid one copy of the Standards in English Language and evidence that Standard used is a recognized and authoritative Standard, which ensures equal or higher quality. Your bid shall be declared non-responsive and rejected if you don't submit required evidence and a copy of such Standards in English Language with your bid. In case where metric or foot-pounds-second (F.P.S) system is specified only those Standards will be considered.

11.0 **SCOPE OF SUPPLY, SPECIFICATIONS & BOQ**

The 'Scope of Supply & Specifications' of Power Generation System & Allied Equipment Package along with Data sheets, Drawings and other technical documents shall be as detailed in enclosed **Appendix-B**. BOQ / Price Schedule shall be as per **Appendix-C**

12.0 **DELIVERY AND ITS DOCUMENTS & COMMISSIONING**

12.1 The Supplier/Manufacturer/Packager shall supply (deliver) complete Power Generation System & Allied Equipment Package as per Scope of Supply & Specifications given in clause 11.0 and other relevant provisions of the Conditions of Contract in eight (08) Months on CFR Karachi Seaport Basis from the date of establishment of Supply Letter of Credit (L/C) by OGDCL. Deliveries must be made as indicated in the material/equipment list. The Power Generation System & Allied Equipment shall remain at the risk of the Manufacturer/Packager until delivery has been made.

12.2 Supply (Delivery) of Power Generation System & Allied Equipment Package shall be made when it arrives at Karachi Sea Port and all documentation specified in 12.4 has been submitted to OGDCL.

12.3 The Supplier/Manufacturer/Packager shall also commission the Power Generation System & Allied Equipment Package within tentatively six (06) months after CFR Karachi Sea Port Delivery of the unit. OGDCL in this connection shall issue a notification and Supplier/Manufacturer/Packager will mobilize within three (03) weeks of this notification at Project Site for commissioning of Power Generation System & Allied Equipment Package.

12.4 Immediately after each shipment, the Supplier shall submit following shipping documents (Negotiable) to their advising bank and copy (Non-Negotiable) as per instructions stipulated in **Annexure XIV-A, Section-III** to OGDCL Project Manager through courier.

▪ **Shipping Documents**

- a) Original Clean board ocean vessel Master bills of lading/Airway bill.
- b) Detailed invoice showing description, quantity unit price and total price strictly in line with the Contract.
- c) Packing list as per International Standards.
- d) Certificate of origin.
- e) Certificate and list of measurements and weight gross/net.
- f) Insurance declaration.
- g) Warranty Certificate
- h) Certificate of compliance of the credit terms as per point c (above) in respect of Packing.
- i) Insurance declaration. A copy of the Fax sent to Insurance Co. in compliance to Clause 8.
- j) A Copy of the Fax sent in compliance to the Clause 6.1 of **Annexure XIV-A, Section-III**
- k) Certificate of Brand New Equipment.

The above documents should be received by Manager (Foreign) Procurement at least 10 days before arrival of the goods at the Karachi Port / Air Port and if not so received, the Manufacturer / Packager will be responsible for all expenses resulting from any delay in customs clearance caused thereby and extension of the period of insurance coverage by corresponding period of delay.

▪ **Other documents to be sent to OGDCL/Project Manager::**

- i) Test Certificate - 6 copies
- ii) Warranty Certificate - 6 copies
- iii) Certificate that all equipment and materials are brand - 6 copies
- iv) Following Documents: - 6 copies
 - All drawings and specifications/data sheets.
 - Complete equipment data books including MTCs, Inspection Certificates, all Test Reports, Performance Test Reports etc.
 - Installation, operations & maintenance manuals.
- v) In addition to the instructions provided in the technical specifications/data sheets, Vendor shall comply with the following requirements for Installations, Operations and Maintenance Manuals:
 - The front cover, spine and inside page shall state the purchase order number and Vendor's reference number.
 - The inside front page shall carry an index listing the contents of each section of the manual.
 - Individual sections shall be complete and shall refer to equipment actually supplied.
 - Published data shall be included, including published data for bought-in items.
 - Devices requiring adjustment and settings shall be fully documented and settings listed.
 - A punch list of 'do's" and don'ts" shall be included.
 - Full details for installation and setting up shall be included.
 - Recommended test data shall be stated, covering initial and also regular testing.

- Items requiring regular inspection, checking, testing and maintenance shall be listed and the time scale clearly indicated

- Important items shall be cross referenced to other parts of the manual as necessary.

vi) Insurance Declaration - 6 copies

12.5 Upon receipt of the purchase order, the Supplier/Manufacturer/Packager is required to furnish the following:

- a) Within three (03) weeks, the schedule of design, manufacture, delivery and commissioning program in two copies. The schedule shall indicate the time table of the activities including, manufacturing stages, assembly, testing and delivery of the equipment and commissioning. Within ten (10) weeks of the receipt of purchase order the Supplier/Manufacturer/Packager shall supply to OGDCL, the fabrication specifications and drawings for its comments/approval and schedule of design review meetings. The Supplier/Manufacturer/ Packager shall also submit bi-monthly progress reports indicating the manufacturing status report.
- b) Within ten (10) weeks of the receipt of purchase order, 4 sets with one reproducible of each certified equipment mounting and dimensional drawings and equipment weight for the purpose of foundations/piping design.

13.0 **MANUFACTURER'S OBLIGATIONS**

13.1 **General Obligations**

The Supplier/Manufacturer/Packager shall supply all the required equipment, commissioned it and testing the same in accordance with the Contract, and shall remedy any defects in any of Power Generation System & Allied Equipment Package. When completed, the Generation System shall be fit for the purposes for which it is intended as defined in the Contract.

The Supplier/Manufacturer/Packager shall provide the documents specified in the Contract, and all machinery, testing & equipment, Manufacturer's personnel, goods, consumables and other things and services, required in and for completion of its obligations & responsibilities & its commissioning.

The obligations/responsibilities under the Contract shall include any work, which is necessary to satisfy OGDCL's requirements, or is implied by the Contract, and all works, which (although not mentioned in the Contract) are necessary for the completion, or safe and proper operation, of the Power Generation System & Allied Equipment Package covered in the Contract.

The Manufacturer shall, whenever required by OGDCL, submit details of the arrangements and method, which the Manufacturer proposed to adopt for supply & commissioning of Power Generation System & Allied Equipment. No significant alteration to these arrangements and methods shall be made without this having previously intimated and approved by OGDCL.

13.2 **Manufacturer/Packager's Representative**

The Supplier/Manufacturer/Packager shall appoint the Manufacturer/Packager's Representative and shall give him all authority necessary to act on the Manufacturer's behalf under the Contract.

The Supplier/Manufacturer/Packager shall obtain OGDCL consent of Manufacturer/Packager's representative, if not named in the contract. For obtaining the consent, the particulars of the persons, his qualification experience, is required to be submitted.

The Supplier/Manufacturer/Packager shall not, without the prior consent of OGDCL, revoke the appointment of the Manufacturer/Packager's Representative or appoint a replacement.

The Supplier/Manufacturer/Packager's Representative may delegate any powers, functions and authority to any competent person and may at any time revoke the delegation. Any delegation or revocation shall not take effect until OGDCL has received prior notice signed by the Manufacturer/Packager's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

14.0 **DELIVERY PERIOD**

The timely delivery of the supply & commissioning of Power Generation System & Allied Equipment Package by the Supplier/Manufacturer/Packager shall be the essence of the Contract, as OGDCL has to meet its obligations for completion of the facility. Accordingly, the Manufacturer is required to complete the delivery of Power Generation System & Allied Equipment Package on CFR Karachi by Sea Port basis in eight (08) months from the date of establishment of Supply LC.

Delivery of the goods shall be made by the Supplier/Manufacturer/Packager in accordance with the terms specified in this Conditions of Contract and Power Generation System & Allied Equipment Package shall remain at the risk of the Supplier /Manufacturer/Packager until delivery has been made.

Delivery shall be deemed to have been made when a clean on board ocean vessel master Bill of Lading together with all such documentation as shall be specified in the Conditions of Contract have been submitted to the OGDCL. Partial shipment(s) within the delivery period (s) will be acceptable.

15.0 **CONTRACT PRICE AND PAYMENT MECHANISM / TERMS**

15.1 **Contract Price**

In consideration of the due performance of the obligations of the Manufacturer/Packager under the Contract, OGDCL shall pay the Manufacturer/Packager an amount of _____ for Supply & Commissioning of Power Generation System & Allied Equipment Package as per Scope of Supply & Specifications given in clause 11.0 above.

The Contract covers the total payment for Supplier/Manufacturer/Packager's obligations under the Contract. This price shall be firm price and not subject to any escalation or alteration regardless of any circumstances whatsoever even unforeseeable at present.

- a) For those inputs to the Project which the Bidder expects to supply by importing them from outside Pakistan (referred to as the "foreign currency component") shall be in US Dollars or other internationally convertible currency.
- b) For those inputs to the project which the Bidder expects to supply from within Pakistan in Pak Rupees. The price shall be on ex-Project site delivery basis.

The custom duties/taxes etc as levied on import of plant and machinery etc required for design, manufacturing, supply, & commissioning of power generation system & allied equipment package of MELA Compression facility and allied packages which do not form part of the Plant shall be on Contractor's account.

The OGDCL shall also be responsible for port clearance, payment of import duties/taxes (as per relevant SRO), inland transportation of packages from Karachi Port to Project Site. The Marine Insurance will be arranged by the OGDCL.

The prices shall be inclusive of all applicable taxes as per Tax Clause#37, Section-IV, ITB of this tender document. Tax deductions shall be made accordingly.

Third Party Inspection Agency will be appointed by OGDCL.

The price summary is given below while details are provided in Price Schedule given in **Appendix-I**.

15.2 **Payment Mechanism / Terms**

▪ **Payment Mode:**

Supply

For the contract price of supply of Power Generation System & Allied Equipment Package (including spares, testing expenses and operational consumables) Contract will be signed and OGDCL shall establish first irrevocable letter of credit in currency of Contract and as per requirements of State Bank of Pakistan, Custom authorities and other government organizations, Terms and Conditions of L/C are given in **Annexure-XIV-A of Section-III, ITB.**

The letter of credit for the supply part shall be valid for a period of fifteen (15) months from the date of its establishment

The Bank charges for establishment of L/C, additional confirmation and any subsequent amendments in L/C will be borne as follows:

- a) All charges for L/C opening inside of Pakistan will be borne by OGDCL.
- b) All charges for L/C outside Pakistan and confirmation will be to the beneficiary's account the LC established.

The payment terms for supply of Power Generation System & Allied Equipment Package are given below:

- Seventy Five (75) percent of the Contract Price shall be paid by OGDCL on complete shipment of Power Generation and Allied Equipment Package ordered. Partial Shipment / Partial Payment will be allowed in LC.
- Five (05%) of the contract price shall be paid upon complete delivery and after inspection On submission of Manufacturer, original invoice (duly verified by OGDCL), accompanied by a certificate issued by OGDCL that ordered equipment has been received, inspected and accepted. Supplier shall be responsible for completeness of supplies by inspecting the material

arrived at site before the installation of package at site by sending OEM's representative(s) by participation the inspection performed by OGDCL.

- Twenty (20) percent of the contract price shall be paid after thirty (30) days of successful commissioning on submission of original Supplier/Packager invoice (duly verified by OGDCL) accompanied by a certificate issued by OGDCL that the Power Generation System & Allied Equipment Package has been successfully commissioned. Or Twenty Four (24) months from date of supply of Power Generation System & Allied Equipment Package & inspection/acceptance by OGDCL in Pakistan, whichever occur first.

Services

For the contract price of services portion to be provided by the Supplier/packager w.r.t supply of Power Generation System & Allied Equipment Package Service Order will be signed by OGDCL & Packager/Supplier simultaneously (at the time of contract signing), 2nd irrevocable L/C shall be established by OGDCL in currency of contract and as per requirements of State Bank of Pakistan, Custom Authorities and government authorities. Terms & Conditions of L/C for Services are given in

Annexure-XIV-B of Section-III, ITB

The letter of credit for the services part shall be valid for a period of seven (07) months from the date of its establishment

The Bank charges for establishment of L/C, additional confirmation and any subsequent amendments in L/C will be borne as follows:

- a) All charges for L/C opening inside of Pakistan will be borne by OGDCL.
- b) All charges for L/C outside Pakistan and confirmation will be to the beneficiary's account the LC established.

The charges for the following services shall be paid by OGDCL to Manufacturer/Supplier in the currency of contract as per requirements of State Bank of Pakistan, Custom Authorities and government authorities in the 2nd irrevocable L/C established by OGDCL.

– **Supervision Services during Erection/Installation**

The charges of expert involved in providing supervision services during erection/installation of Power Generation System & Allied Equipment Package shall be paid on actual man-days (if less than man-days are consumed than estimated otherwise on lumpsum basis) in Thirty (30) days of successful completion of services and submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the services have been provided as per OGDCL's requirement.

– **Pre-Commissioning, Commissioning & Start-Up, Performance Testing Charges**

The charges for Pre-Commissioning, Commissioning and Start-Up, performance testing of Power Generation System & Allied Equipments shall be paid by OGDCL on actual man-days (if less than man-days are consumed than estimated otherwise on lumpsum basis) in thirty (30) days of successful commissioning on submission of supplier original invoice duly verified by OGDCL Representative and a certificate issued by OGDCL that the Power Generation System & Allied Equipment has been successfully commissioned.

– **Training at Site**

The charges for providing training to OGDCL personnel at Project Site shall be paid by OGDCL (on manday basis) within thirty (30) days of successful completion of training program against Manufacturer/Packagers original invoice duly verified by OGDCL.

All services payment are subject to deduction of income tax and provincial sales tax.

16.0 **PROGRESS REPORTING**

- 16.1 At fifteen (15) days intervals during the performance and duration of the Contract the Manufacturer shall submit progress report (three 3 copies) to OGDCL. The reports shall show clearly and accurately the position of all activities associated with the supply & commissioning of Power Generation System & Allied Equipment (including inspection testing). The progress reports shall be set out in a format approved by OGDCL.

16.2 A delay due to any reason which may affect the delivery, inspection and testing dates shall be reported by the Manufacturer to OGDCL giving specific reasons for such delay therein. The report shall state the action being taken to overcome such delay and to ensure adherence to the agreed project schedule.

17.0 **PATENT RIGHTS**

The Manufacturer/Packager shall indemnify and hold OGDCL harmless against all actions, claims, demands, costs, charges, damages and expenses arising from or incurred by reason of any infringement of patent, trade mark or industrial design rights arising from use of the equipment or any part thereof.

18.0 **SPARE PARTS**

The Manufacturer/Packager shall have proposed in his list of recommended spare parts where so required, necessary for the satisfactory operation and maintenance for the period specified in Price Schedule **Annexure-I of Section-III, ITB** of the equipment/goods supplied under the Contract. The OGDCL shall have the right to purchase all of the recommended spare parts at the unit price quoted within six (6) months of the date of Contract.

19.0 **WARRANTY**

19.1 The Supplier/Manufacturer/Packager warrants that the supply & commissioning of Power Generation System & Allied Equipment Package and other Works carried out shall be of good quality, free from all faults or defects and shall perform so as to comply with the specifications contained in the contract documents or with any revisions thereof pursuant to any changes. The Supplier/Manufacturer/Packager further warrants that all works performed under the Contract shall be in accordance with industry's recognized codes and standards.

19.2 The Supplier/Manufacturer/Packager further warrants that the Power Generation System & Allied Equipment Package supplied & commissioned under the Contract shall be:

- a) Be new, of good quality, free from all defects and having good title and for the use intended
- b) Conforms in all respect with the specifications and requirements given in the Contract.

- c) The commissioning work shall be undertaken as per Provisions of the Contract.

- 19.3 The foregoing warranties shall remain valid for a period of twelve (12) months from the date of Acceptance Certificate issued by OGDCL.
- 19.4 If the supplied Power Generation System & Allied Equipment fail to meet the warranty conditions. OGDCL shall promptly notify the Manufacturer in writing about the defects and claims under the warranty. Upon receipt of such notice the Manufacturer shall within the time specified by OGDCL repair/replace the defective equipment, material, with no cost or expense to OGDCL. The repaired or replaced equipment, material shall be warranted by Manufacturer for twelve (12) months from the date of repair(s) or replacement(s).

If the Supplier/Manufacturer/Packager having been notified fails to remedy the defect(s) within the specified time, OGDCL shall proceed to take remedial actions as may be necessary, at the Manufacturer's risk and cost. All costs thereof shall be charged to the Manufacturer or recovered from performance bond. The Manufacturer shall have no objection to the above and he hereby acknowledges the rights of OGDCL to recover such sums as a debt due to OGDCL from defaulting Manufacturer. It is understood that in this case the Manufacturer shall not be relieved from the provided warranties and contractual obligations.

20.0 **PERFORMANCE BOND / BANK GUARANTEE**

- 20.1 Within ten (10) days of the receipt of notification of intent to award the Contract from OGDCL, the successful bidder shall furnish a Performance Bond in the Form of Bank Guarantee (**Annexure – II**) for an amount of ten percent (10%) of the Supply & Services Price as a guarantee for the due and faithful performance of the Contract. The said Performance Bond shall be valid up to twelve (12) months from the commissioning of Power Generation System & Allied Equipment or twenty four (24) months from the date of unloading of last consignment of Generation System at Karachi Sea Port. The performance Bond shall be issued by following banks. List of OGDCL approved Banks for submission/issuance of Bank Guarantee are given in **Annexure-XVI** of Tender Document.
- 20.2 The said Guarantee and the terms of the said security shall be in accordance with format given in **Annexure-II of Section-III, ITB** of the Contract. The procurement of such Guarantee and the cost of the security to be so entered into shall be at the expense of the Manufacturer.

- 20.3 The proceeds of the Performance Bond (Bank) Guarantee shall be payable to OGDCL as compensation for any loss resulting from the Manufacturer's failure to fulfill its obligations under the Contract (including guarantee/warranty).

- 20.4 The Performance Bond (Bank) Guarantee shall be released to the Manufacturer after twelve (12) months from the date of the Acceptance Certificate, provided that the Manufacturer has performed and fulfilled guarantee/warranty obligations in pursuance of the Conditions of Contract. If Manufacturer is unable to meet its obligations the Performance Bond will be extended or encashed as per OGDCL's discretion.
- 20.5 The period of validity of the Bank Guarantee shall be extended if the completion of the Contract is delayed, whether in whole or in part. The cost incurred for establishing this Bank Guarantee shall be to the account of the Manufacturer/Packager.
- 20.6 The Bank Guarantee shall be denominated in the currency of the Contract or in another freely convertible currency acceptable to OGDCL and shall be in the form provided in the Bid Documents as **Annexure-II of Section-III, ITB.** The expenses for the Bank Guarantee shall be borne by the Manufacturer/Packager.

21.0 **LIQUIDATED DAMAGES**

- 21.1 Subject to clause 30 of these conditions of Contract "General", If the Supplier /Manufacturer/Packager fails to deliver any or all of the goods within the time period(s) specified in the Contract, the OGDCL shall, without prejudice to other remedies under the contract, deduct from the contract price / Bank Guarantee as liquidated damages, a sum not more than 0.5% of the contract price per week or part thereof for first four weeks, 1.00% per week for next four weeks and 1.5% per week exceeding four weeks up to maximum extent of 10% of the contract value.
- 21.2 In case the OGDCL is satisfied that the delayed / defective shipment was due to some mistake or circumstances beyond the control of the Supplier / Manufacturer / Packager and the Supplier / Manufacturer / Packager has not intentionally or negligently contributed in the delay, the OGDCL may impose Liquidated Damages for not more than a sum equivalent to 0.5% of the delayed or defective shipment per week or part thereof for first two weeks, 1.00 % per week for next three weeks and 1.5% per week exceeding five weeks but not exceeding 10% of the contract value of the delayed/ defective shipment provided that the Supplier/Manufacturer/Packager takes immediate remedial measures for the replacement of defective shipment and takes prompt steps to mitigate the delay. The OGDCL may however, impose Liquidated Damages as per (a) above if the delayed or defective shipment has affected the project completion schedule or has resulted in production losses.

- 21.3 Even after imposition of LDs, if the Manufacturer fails to materialize the delivery (material and or services); the OGDCL reserves the right to cancel Contract/LC and to forfeit the Guarantee (if applicable) after intimating the Manufacturer for such cancellation/forfeiture.

22.0 **PACKING**

- 22.1 The Supplier/Manufacturer/Packager shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the Contract. The packing shall be sufficient to withstand rough handling during transit and exposure to extreme temperatures, salt, and precipitation during transit taking into consideration, where appropriate, the remoteness of the good's final destination and the absence of heavy handling facilities at all points in transit. More specifically packing and storage during shipment should conform to the minimum standard given in the material lists.
- 22.2 The packing, marking and documentation within and outside the package shall comply strictly with such special requirements as shall be expressly provided for in the Contract and, in any subsequent instruction issued by the OGDCL.

23.0 **TRANSPORTATION**

- 23.1 Supplier/Manufacturer/Packager is required under the Contract to deliver the equipment/material on CFR Karachi Sea Port Basis, transport of the material to the port of discharge as specified in the Contract shall be arranged and paid for by the Supplier/Manufacturer/Packager, and the cost thereof shall be included in the Contract Price.
- 23.2 Transportation of equipment / material (consignments) will be arranged through any first available conference liner from the specified port of embarkation to Karachi port if Contract is awarded on CFR basis. Therefore, the Bidders are advised to specify the name of port(s) of embarkation in the bid.
- 23.3 The transportation shall be made by the Supplier/Manufacturer/Packager in accordance with the terms specified by the OGDCL in its Scope of Supply & Specifications and Contract.

No shipment shall be made without the prior authorization of the OGDCL. Any unauthorized shipment will either be returned without prior notice or stored by the OGDCL at the Manufacturer/Packager's expense and risk.

- 23.4 The Supplier/Manufacturer/Packager shall submit to the before shipment:
- A list of packages which by virtue of their nature, size or weight may give rise to difficulties in transport or handling.
 - The probable timetable of shipment in accordance with the schedule so that deliveries are made in the most convenient order for Site Work.

24.0 **PERFORMANCE GUARANTEE & TEST**

- 24.1 The performance of Power Generation System & Allied Equipment Package shall be guaranteed for the site conditions and performance (operating) parameters/requirements given in Scope & Specifications. The guarantee shall be valid for a period of twelve (12) months from date of Provisional Acceptance Certificate issued by OGDCL.
- 24.2 If Power Generation System & Allied Equipment Package do not meet the specified guaranteed performance parameters/requirements during the above mentioned operating period (despite remedial actions i.e. repairs, alterations, modification and replacement by Manufacturer) during a period of three (03) months OGDCL shall claim as Liquidated Damages an amount equivalent to ten (10) percent of the Contract Price (not as penalty) from Manufacturer. The Liquidated Damages shall be paid by the Manufacturer separately or recovered from the available Performance Bank Guarantee

25.0 **TERMINATION FOR DEFAULT**

- 25.1 The OGDCL may, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the Supplier/Manufacturer/Packager, terminate this Contract in whole or in part provided that:
- a) The Supplier/Manufacturer/Packager fails to deliver any or all of the goods within the time periods(s) specified in the Contract, or any extension thereof granted by the OGDCL; or
 - b) The Supplier/Manufacturer/Packager fails to perform any other obligations(s) under the Contract, and provided that the Supplier/Manufacturer/Packager in either of the above cases doesn't remedy his failure within a period of ten days after receipt of the default notice.

25.2 In the event, the OGDCL terminates the Contract in whole or in part pursuant to Clause 25.1, the OGDCL may procure, upon such terms and in such manner as he deems appropriate, goods similar to those undelivered, and the Supplier/Manufacturer/Packager shall be liable to any excess cost for such similar goods which may be deducted from his Bank Guarantee.

26.0 **INSURANCE**

26.1 The equipment/Package supplied under the Contract shall be fully insured for transportation from Manufacturers/Packagers works to Karachi Sea Port.

26.2 Marine insurance will be arranged by OGDCL. However, the Manufacturer/Packager shall send declaration of shipment to the insurer as advised by OGDCL and the Manufacturer/Packager shall be responsible for the consequences for not making such declaration to the insurer in time.

26.3 The Manufacturer/Packager shall immediately notify OGDCL to arrange the marine insurance by fax and provide the full details of the shipment including:

- i) Contract number & L/C number
- ii) Insurance cover note number and date
- iii) Quantity
- iv) Description of Power generation system and Allied equipment packages
- v) Name of the vessel
- vi) Bill of lading number and date
- vii) Port of loading
- viii) Date of shipment
- ix) Expected date of arrival (ETA) at Karachi Sea Port

27.0 **INSPECTIONS AND WITNESS TESTING**

27.1 The Manufacturer/Packager shall carry out required specifications and tests as per requirements specified in the Scope & Specifications and Contract Documents.

27.2 OGDCL shall inspect and witness the Factory Acceptance Test (FAT) and other tests of equipment at Manufacturer/Packager's premises. The Manufacturer/Packager shall provide free of charge all reasonable facilities and assistance (including provision of required information/data). The

inspection/participation by OGDCL shall not relieve the Manufacturer/Packager from its obligations and liabilities under the Contract including Performance and Warranty obligations.

- 27.3 Third Party Inspection Agency will be appointed by OGDCL.
- 27.4 Should any inspected or tested equipment fails to conform to the specifications, OGDCL may reject them and the Manufacturer/Packager shall either replace or make all necessary repairs/alterations/modifications free of cost to meet the required specifications.

28.0 **ACCEPTANCE CERTIFICATE**

When all the required Power Generation System & Allied Equipment Package have been received and tested successfully, the Manufacturer may request OGDCL to issue an Acceptance Certificate. The format of Acceptance Certificate is enclosed in **Attachment-I**.

29.0 **TITLE**

Title of Power Generation System & Allied Equipment Package being supplied & commissioned by Manufacturer or its Sub-Manufacturers under the Contract shall pass to OGDCL on the date the Power Generation System & Allied Equipment Package are completed and Acceptance Certificate is issued by OGDCL.

30.0 **FORCE MAJEURE**

- 30.1 The Supplier/Manufacturer/Packager shall not be liable for forfeiture of his Performance Bond Liquidated damages or termination for default if, and to the extent that , his delay in performance or other failure to perform his obligations under the Contract, are the result of an event of Force Majeure i.e. causes such as natural calamities, war military action, fire as well as other circumstances proved beyond the reasonable control of the Manufacturer/Packager, which may impede the fulfillment of the obligations under this contract.
- 30.2 The Supplier/Manufacturer/Packager shall notify the OGDCL promptly of the occurrence of Force Majeure and submit his case in writing within 15 days of such occurrence.
- 30.3 If any of the parties is prevented to fulfill his assumed obligations by Force Majeure of constant duration of at least one month, the parties shall meet for negotiation. If no satisfactory agreement is reached within a period of total two months from commencement of the Force Majeure conditions, either party shall have the right to cancel the Contract with immediate effect.

31.0 **AMENDMENTS**

No variation in or modification of the terms of the Contract shall be made except by written amendment signed by the parties.

32.0 SUB MANUFACTURER/PACKAGER

No Sub-Manufacturer / Packager(s) shall be awarded without written consent of the OGDCL. Manufacturer / Packager shall notify in writing of all Sub-Manufacturer/Packager(s) awarded under this Contract. Such notification shall not relieve the Supplier/Manufacturer/Packager from any liability or obligation under the Contract.

Sub-Manufacturer/Packager(s) must comply with the provision of clause-5 of Conditions of Contract.

33.0 DELAY IN THE SUPPLIER' PERFORMANCE

Delivery of the goods shall be made by the Supplier/Manufacturer/Packager in accordance with the time schedule specified in the Conditions of Contract.

Any unjustified prolonged delay by the Supplier/Manufacturer/Packager in the performance of his delivery obligations shall render the Contract liable to any or all of the following sanctions:

- Imposition of liquidated damages;
- Forfeiture of performance security
- And / or termination of the Contract for default.

If in any time during performance of the Contract, the Supplier/Manufacturer/Packager or his Supplier/Manufacturer/Packager should encounter conditions impeding timely delivery of the goods, the Manufacturer/Packager shall promptly notify the OGDCL in writing of the facts of the delay, likely duration and causes(s). After receipt of such notice, Supplier/Manufacturer/Packager's case shall be evaluated for any possible extension in time for performance of the Contract. Any extension granted shall be ratified by the parties by amendment in the Contract.

34.0 ASSIGNMENT

The Supplier/Manufacturer/Packager shall not assign, in whole or in part, its obligations to perform under the Contract, except with prior written consent of OGDCL.

35.0 APPLICABLE LAWS

The Contract shall be interpreted in accordance with the laws applicable in the Islamic Republic of Pakistan.

36.0 **RESOLUTION OF DISPUTES**

If any question, difference or dispute shall arise under this Contact regarding which the parties are unable to agree, such matter may be referred for arbitration. This includes without limitation, the question of whether one or the other is in default and what action, if any, shall be taken to remedy such default. Either party may notify the other in writing specifying the nature of dispute and designating one of the arbitration to whom such dispute shall be referred to requesting that the other party give notice in writing within thirty (30) days after the designation of the second arbitrator. The arbitrators shall within thirty (30) days appoint an umpire whose decision with respect to the dispute shall govern in the event that the arbitrators shall fail to agree. In the event that no second arbitrator is designated within the time specified, the first arbitrator shall have full and complete power to determine the dispute. Arbitration award shall be final and binding on all parties. It is further agreed that such arbitration shall be precedent to any action of law and that the provisions of the Pakistan Arbitration Act 1940, and the rules framed there under shall apply to the arbitration proceedings. The venue of the arbitration proceedings shall be in Pakistan.

The expenses of any arbitration hereunder shall be charged equally to the parties to the dispute unless the award of the arbitrator, the arbitrators, or the umpire, as the case may be, shall otherwise provide.

37.0 **TAXES**

37.1 All taxes on the income or payments to the contractor arising, accruing or resulting under the contract, whether present or future, assessed or payable inside or outside Pakistan shall be the exclusive responsibility of the contractor or its sub-contractor(s). Company, in order to discharge its responsibilities as withholding agent shall withhold income tax from the payments to the contractor within the contract value at the rates applicable at the time of payments.

37.2 Sales tax on goods as well as services is applicable in Pakistan under federal/provincial sales tax laws. The Manufacturer/Supplier/Packager being registered with respective federal/provincial revenue authority of Pakistan is entitled to charge applicable sales tax over and above its bid price and will be responsible for the payment of such sales tax to the respective revenue authority as per the prevailing federal/provincial sales tax laws. OGDCL being the withholding agent shall withhold sales tax from the contractor (whether registered or unregistered), as per respective sales tax withholding rules.

- 37.3 Any indirect tax including value added tax, sales tax etc. present or future, applicable outside Pakistan shall be exclusive responsibility of the Manufacturer/Supplier/Packager.
- 37.4 The Manufacturer/Supplier/Packager shall be responsible for income tax and all other taxes levied on the Manufacturer/Supplier/Packager's and its sub-contractor's expatriate personnel, their social security obligations and contributions regardless of whether such contributions are levied on employer or employee or both in Pakistan or outside Pakistan
- 37.5 The Manufacturer/Supplier/Packager shall keep OGDCL informed of the steps taken by it to discharge the tax obligations under the Contract and provide supporting documents whenever required by the OGDCL.
- 37.6 The Manufacturer/Supplier/Packager shall indemnify OGDCL against any claim which might occur due to non-compliance by Manufacturer/Supplier/Packager of any legal obligation regarding taxes, duties, fees, levies, or other charges, including taxes on income and sales tax in Pakistan and any other payments due to the Federal or Provincial Governments, their agencies or any other relevant authority.
- 37.7 All clearing and brokerage charges incurred shall be to the account of Manufacturer/Supplier/Packager.
- 37.8 Manufacturer/Supplier/Packager agrees not to sell, transfer or dispose any of its machinery, equipment, spare parts or material imported under this contract within the country without prior written approval from COMPANY and without payment of taxes (including custom duties etc) due to the Government.
- 37.9 Manufacturer/Supplier/Packager is responsible to settle all COMPANY obligations or guarantees with the customs authorities and to clear COMPANY of all such responsibilities.
- 37.10 Manufacturer/Supplier/Packager is responsible to obtain all customs approvals and other documentations. COMPANY will endeavor to assist Manufacturer/Supplier/Packager in obtaining such approvals and documentation.
- 37.11 The above clauses relating to payment of taxes would prevail notwithstanding a contrary expression reflected in any other clause of the contract

ATTACHMENT – I

PROVISIONAL ACCEPTANCE CERTIFICATE

ATTACHMENT-I

PROVISIONAL ACCEPTANCE CERTIFICATE

Effective Date:.....

CONTRACT No..... Dated.....

Between:

Oil & Gas Development Company Limited (hereinafter called OGDCL)

And

.....(hereinafter called Contractor)

1. Pursuant to Article 28.0 of the Contract, it is hereby certified that the Power Generation System and the WORK performed by the Supplier/Manufacturer/ Packager under the Contract are, effective upon the .../.../... provisionally accepted, with the exception of the outstanding items listed upon the attached Punch List.
2. In accordance with the Contract, the Warranty Period will commence on the .../.../... which shall be the Effective Date for the purpose of this PROVISIONAL ACCEPTANCE CERTIFICATE, it being understood that should Contractor fail to complete all outstanding Punch List items by the .../.../... the PROVISIONAL ACCEPTANCE CERTIFICATE shall be null and void and the requirements of sub-Article ____ shall apply in full and the Effective Date of the PROVISIONAL ACCEPTANCE CERTIFICATE shall be revised accordingly.
3. Issuance of this PROVISIONAL ACCEPTANCE CERTIFICATE shall not relieve Supplier/Manufacturer/Packager from his warranty obligations and other provisions of the Contract which expressly or by their nature survive the said certificate.

For and on behalf of
(Oil & Gas Development Company Limited)

For and on behalf of
(Contractor)

Signature:

Signature:

Name:

Name:

Position:

Position:

In presence of:

In presence of:

Signature:

Signature:

Name:

Name:

Position:

Position:

Date:

Date:



OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO.

TENDER DOCUMENTS
FOR
SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM
& ALLIED EQUIPMENT PACKAGE
(VOLUME – II)



Submitted By:



Zishan Engineers (Pvt.) Ltd.

An ISO 9001-2015, 14001-2004 & 18001-2007 certified company

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OIL & GAS DEVELOPMENT COMPANY LTD.

TENDER NO.

SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM & ALLIED EQUIPMENT PACKAGE

(SECTION – V)

SCOPE OF SUPPLY



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SCOPE OF SUPPLY & COMMISSIONING FOR
POWER GENERATION SYSTEM AND
ALLIED EQUIPMENT PACKAGE



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OIL & GAS DEVELOPMENT COMPANY LTD.

INSTALLATION OF CONDENSATE STABILIZATION UNIT, COMPRESSORS AND ALLIED FACILITIES AT MELA

SCOPE OF SUPPLY & COMMISSIONING FOR POWER GENERATION SYSTEM AND ALLIED EQUIPMENT PACKAGE



A	03-04-2019	Issued for Review	MF	NAK	MAS
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1.0 **INTRODUCTION**

Oil & Gas Development Company Limited (OGDCL) is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to undertake Installation of Compressors, Slug Catcher and related utilities in one of the fields, MELA. MELA is located in KPK Province of Islamic Republic of Pakistan.

Existing MELA facility consist of gathering manifold, Separation System, Dehydration Unit, Condensate Storage, Condensate Loading System, Off Gas Compressors, Produced Water Treatment System etc.

Mela Gas Processing Plant is intended to normally process 10.5 MMSCFD of feed gas from Mela wells with a design margin of 10%.

OGDCL has engaged services of Zishan Engineers (Pvt.) Ltd. (ZEL) to prepare procurement packages for Mela Plant.

This tender document for Generation System package has been prepared as per Public Procurement Regularity Authority (PPRA) requirements and provides the basis for supply & commissioning of Generation System Package.

2.0 **GENERAL**

2.1 **Scope**

This document intends to specify the scope of supply and commissioning for the Power Generation System and Allied equipment Package. This document shall be read in conjunction with all other documents included in the Power Generation System and Allied equipment Package Tender Document, of which this document is a part.

All requirements mentioned in the attached specifications, drawings and other documents shall be deemed to be inclusive in the PACKAGER/SUPPLIER's scope of work.

PACKAGER/SUPPLIER's scope shall include design, manufacture, assembly, inspection, factory testing, packaging, shipment, Pre-commissioning, Commissioning, assistance for start-up, etc. as defined in the requisition/Tender Document.

2.2 **Definitions**

COMPANY: Oil & Gas Development Company Ltd.
(OGDCL)

PACKAGER / The organization, firm or agency with whom
PACKAGER/SUPPLIER: order for the supply of equipment and or material
has been placed.

2.3 **Errors or Omissions**

2.3.1 The review and comment by the COMPANY of any PACKAGER/SUPPLIER's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the PACKAGER/SUPPLIER of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

2.3.2 Any errors or omissions noted by the PACKAGER/SUPPLIER in this Specification shall be immediately brought to the attention of the COMPANY.

2.4 **Deviations**

All deviations to this specification, other specifications or attachments shall be brought to the knowledge of the COMPANY as a section in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the COMPANY. Such deviations shall be shown in the documentation prepared by the PACKAGER/SUPPLIER.

2.5 **Conflicting Requirements**

In the event of any conflict, inconsistency or ambiguity between the PACKAGER/SUPPLIER's scope of work, this Specification, National Codes & Standards, referenced in the Project Specification or any other documents, the PACKAGER/SUPPLIER shall refer to the COMPANY whose decision shall prevail.

2.6 **Reporting Procedure**

2.6.1 A reporting and documentation system shall be agreed between the PACKAGER/SUPPLIER and the COMPANY for the status of procurement, design, manufacturing, inspection, testing and shipment of the equipment/material to be supplied under this specification. PACKAGER/SUPPLIER shall provide reports and summaries for production performance and testing operations in conformance with a manufacturing schedule approved by COMPANY.

2.6.2 Daily, weekly monthly and run summaries of all major aspects of the production process shall be provided as reports to the COMPANY.

2.6.3 **Third Party Inspection**

In addition to the inspection and witnessing of tests by the inspectors during the manufacturing and shipment of the Equipment/Material, COMPANY may appoint a third party or its own inspector for witnessing of the inspection and tests to be carried out at PACKAGER/SUPPLIER's facility under this specification.

2.7 **Unit Responsibility**

The PACKAGER/SUPPLIER shall assume full unit responsibility for the complete Package. The PACKAGER/SUPPLIER shall handle and expedite drawings and data, and supervise and coordinate all inspection and testing specified.

PACKAGER/SUPPLIER shall guarantee that all material of the specified Power Generation System and Allied equipment Package shall be new, unused and of the required/specified grade.

3.0 **APPLICABLE CODES, STANDARDS AND REGULATIONS**

The Power Generation System and Allied equipment Package shall as a minimum, comply with, and not be limited to the latest editions of International Codes and Standards and all relevant Local Regulations and Standards as applicable, including:

(All codes and standards mentioned in all other attached specifications shall also be complied with)

3.1 **International Codes and Standards**

ABMA

ABMA 9	Load Rating and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings

ANSI

ANSI C57.13	Standard Requirements for Instrument Transformers
ANSI C50.10	Rotating Electrical Machinery – Synchronous Machines
ANSI C50.13	Rotating Electrical Machinery – Cylindrical Rotor Synchronous Generators

API - American Petroleum Institute

API 670	Vibration, Axial-Position and Bearing Temperature Monitoring Systems
API 671	Special Purpose Couplings for Petroleum Chemical and Gas Industry Services
API 614	General Purpose Lube Oil System Components for Rating Process Equipment

IEEE - The Institute of Electrical and Electronic Engineers

IEEE STD 43	Recommended Practice for Testing Insulation Resistance of Rotating Machinery
IEEE STD 85	Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
IEEE STD 115	Test Procedures for Synchronous Machines
IEEE STD 421.5	IEEE Recommended Practice for Excitation System Models for Power System Stability Studies

NEMA - National Electrical Manufacturers Association

NEMA MG 1 Motors and Generators

NFPA - National Fire Protection Association

NFPA 70 Fire Fighting

BS – British Standards

BS 4999 General Requirements for Rotating Electrical Machines

BS 7671 Requirements for Electrical Installations

IEC – International Electrotechnical Commission

IEC 60034 Rotating Electrical Machines

IEC 60072 Dimensions and Output Ratings for Rotating Electrical Machines

IEC 60079 Electrical Apparatus for Explosive Atmospheres

IEC 60085 Thermal Evaluation and Classification of Electrical Insulation

IEC 60529 Classification of Degree of Protection Provided By Enclosures

IEC 60909 Short-Circuit Calculation in Three –Phase A.C. Systems

IEC 60185 Current Transformers.

IEC 60186 Voltage Transformers.

IEC 60417 Graphical symbol for use on equipment.

IEC 60255 Electrical relays.

IEC 61439 Low-voltage switchgear and control gear assemblies

IEC 60144 Degrees of protection of enclosures for L.V. switchgear and control gear.

IEC 60129	A.C. disconnectors (isolators) and earthing switches.
IEC 60051	Recommendations for direct acting indicating electrical measuring instruments and their accessories.
IEC 60947	Low voltage switchgear and control gear
IEC 60034-5	Degrees of protection by enclosures for rotating machinery
EEMUA 140	Noise Procedure Specification Guidelines
ISO 8528	Reciprocating internal combustion engine driven alternating current generating sets
ISO 3046	Reciprocating internal combustion engines

3.2 **Language**

The governing language of the Contract shall be English language. All notices, correspondence, Information, literature, data, manuals and other documents required under the Contract shall be in the English language.

4.0 **ENVIRONMENTAL CONDITIONS**

4.1 **Environmental Data**

Refer attached Specification No. 165-2-SPG-029 (Site, Environment & Utility Data)

5.0 **ELECTRICAL SYSTEM OVERVIEW**

This section briefly describes the outlines of the Electrical Generation and Main distribution envisaged for the Project. The power generation system shall consist of 1 Nos. operating & 1 No. standby (1+1), 400V gas engine driven generators for the main or normal operation and a diesel engine driven generator for the emergency & black start operation of the Plant. The VENDOR shall also provide each Generator's Unit Control Panels complete with all necessary modules and interconnecting cabling of all types complete in all respects.

Vendor shall also be responsible to furnish any other auxiliary power supply panels, where required to feed engine / generator auxiliaries including all auxiliary power cabling required to complete the system.

UCP and auxiliary panels are expected to be placed in electrical room, near the Generation shed. Accordingly vendor shall supply all cabling quantities considering a distance of around 70 m between Generator skids and remote mounted panels.

Essential power for the plant shall be provided by 1 No. 400V, 3 Phase, 50 Hz emergency diesel engine-driven generator.

On loss of normal power at the Emergency bus bar, the emergency diesel generator shall start up automatically with provision for manual start up selection. It shall be capable of starting, accelerating to operating speed, and carrying full load within twenty seconds after actuation of the start signal. When the generator has attained rated volts and speed, the control system will automatically close the incoming feeder and connect the generator onto the emergency bus.

The emergency diesel generator will also be capable of starting under 'black start' conditions, when no utilities or other services are available.

All the above mentioned shall be connected and synchronized to a common 400V Main LV Switchgear (SWG-001), which shall also be included in the package VENDOR's scope as per circuit configuration shown on single line diagram. This bus bar shall comprise of multiple sections coupled through intermediate bus couplers, as shown in the Key Single Line Diagram (165-2-ELS-001).

All generators shall be synchronized including emergency genset. This synchronization will be achieved in dedicated panels, which will also incorporate automatic generator starting, automatic load transfer and interlock controls for the operation of generator switchgear and bus couplers.

All the auxiliary power, control and instrument cabling between generator panel(s), its auxiliaries, sync panels and switchgear (SWG-001) is considered as part of the CONTRACTOR scope. CONTRACTOR shall supply a ready to install package complete in all respect.

Main power line cable from generator to SWG-001 will be provided by Company, All other cable required for the generation package's complete functioning shall be considered in PACKAGER / SUPPLIER scope.

6.0 **PACKAGER/SUPPLIER'S SCOPE OF SUPPLY**

6.1 **General**

PACKAGER/SUPPLIER's scope shall includes design and drawings relevant to package equipment, provision of all materials, manufacture, assembly, inspection, factory testing, packaging, shipment, on-site testing, Pre-commissioning, Commissioning, assistance for start-up etc. as defined in the requisition/Tender Document.

6.2 **PACKAGER/SUPPLIER's Specific Responsibilities**

The PACKAGER/SUPPLIER's specific responsibilities viz-a-viz its scope of work for the 'Power Generation System and Allied equipment Package' shall include the following as a minimum:

- Supply of all equipment within the package battery limits as defined in the subsequent section.
- Soliciting COMPANY's approval on VENDOR's submitted design and technical data.
- Verification of the technical requirements of the Tender package.
- Indication of all technical deviations / exceptions to this requisition and notifying COMPANY of all such deviations / exceptions.
- Factory Acceptance Tests (FAT) of the supplied equipment at Vendor's works duly witnessed by COMPANY and / or its representative.
- Preparation of equipment packaging, consideration of shipping / delivery arrangements and delivery on-site.
- Pre-commissioning, Commissioning and startup services for the Package.
- Supply of Start-up and Commissioning Spares.
- Supply of two (2) years Operational Spares.
- Provision of equipment / system guarantee, warranties and all required material certifications.

- Training for COMPANY's operators and maintenance team including preparation of training manuals.
- Complete documentation as required during all phases of the project including, but not limited to, design deliverables, fabrication data / shop drawings, Material Certificates, Test Reports, Manufacturing Schedule, Installation manuals, Test procedures, Pre-commissioning, commissioning, startup manuals, Operating & Maintenance Manuals / dossiers, etc.
- Any other activity not specified above but necessary to deliver the mentioned equipment / works as a safe and reliable system.

6.3 **Scope of Supply**

The package shall be supplied as per requirements of this Tender Document and attached Data sheets, Specifications & drawings. The package shall contain the following major equipment as a minimum:

- 2 Nos. Gas Engine Driven Generators, size as mentioned in data sheet, 400V, 3-phase, 50 Hz as self contained unit assemblies, including all auxiliaries, acoustic canopy, Unit Control Panel, local gauge boards, and AC power supply unit (Auxiliary panels) for auxiliaries, complete in all respects as further detailed in this document and referred specifications / data sheets.
- 1 No. Diesel Engine Driven Generator 400V, 3-phase, 50 Hz, as self contained unit assembly, including all auxiliaries, Sub base tank, acoustic canopy, Unit Control Panel, local gauge boards, and power supply unit for auxiliaries, complete in all respects as further detailed in this document and referred specifications / datasheet.
- A Control System for Power Generation Package Controls including but not limited to all on skid and off skid sensors / instruments, etc. and Generator Control Panels for each of the above mentioned generators and other control panels as required for synchronizing, load sharing, Auto starting etc
- 400V low voltage switchgear, SWG-001, (comprising of generation feeder protection, circuit breaker, bus coupler, outgoing feeder breakers etc (as shown on SLD) complete with all protection functions (through electronic protection relay), metering, measurement functions, synchronizing/interlocks (as defined in SLD) etc, complete in all respect.

- Power for the switchgear control circuits shall be based on 230VAC and to be derived by Package Vendor from SWG-001 bus through dedicated control transformer.
- Fire Detection System inside Generator Canopies be considered complete with Alarms (and any necessary shutdown).
- All the auxiliary power, control and instrument cabling between generator panel(s), its auxiliaries, sync panels and switchgear (SWG-001) is considered as part of the CONTRACTOR scope. CONTRACTOR shall supply a ready to install package complete in all respect.
- Exhaust piping / ducting.
- Package vendor shall also supply auxiliary power supply panel (400V / 230V AC) for all gensets auxiliary loads. Each genset shall have a dedicated auxiliary panel. Depending on Vendor's standard, this auxiliary supply panel may either be separate from UCP or be a part of the UCP panel assembly. For incoming supply to these auxiliary panels, Package vendor shall provide necessary outgoing breakers on SWG-001.
- Canopy shall be provided complete with lighting including all necessary light fixtures, wiring system, junction boxes, etc. The lighting circuit shall be fed by Packager/Supplier from its auxiliary panel.
- For Gas Generators, COMPANY will provide fuel gas (of composition, pressure and temperature as mentioned in P&ID and elsewhere in Tender Document) upto the PACKAGER / VENDOR'S battery limit. PACKAGER / VENDOR shall be responsible to provide and all integral all necessary equipment for further considering of fuel gas (pressure regulation liquid knock outs, etc.) as per engine fuel specification.
- Double filters with isolation valves for each power genset and regulation prior to fed the fuel gas in power genset.
- Company provided Fuel gas conditioning as per following operating conditions and compositions at Power Genset is as follows.

Pressure 100 to 70 Psig
Temperature 130 F to 40 F

Composition as given below

6.3.1 Company's Responsibility

- Company will provide 230 VAC, 50 Hz power supply feeder(s) for generator UCPs from its UPS source. Package Vendor, however shall indicate power requirements for the same in its bid. Furthermore source for any other voltage level (such as 24VDC etc) shall be furnished by Package Vendor.
- Fuel Tie-in for fuel gas conditioning for the following operating conditions and compositions at Power Genset.

Pressure 100 to 70 Psig

Temperature 130 F to 40 F

Composition as given below

Following is the gas composition / parameters data for the source.

Component	Case-1	Case-2	Case-3
	Mole Fractions	Mole Fractions	Mole Fractions
CO2	0.0129	0.0145	0.0125
Nitrogen	0.0096	0.0063	0.0104
Methane	0.7818	0.6506	0.8165
Ethane	0.095	0.1311	0.086
Propane	0.0588	0.122	0.0426
i-Butane	0.0111	0.0268	0.0069
n-Butane	0.0173	0.0333	0.0127
22-Mpropane	0.0001	0.0001	0
i-Pentane	0.0046	0.0064	0.0038
n-Pentane	0.0038	0.0048	0.0032
n-Hexane	0.0021	0.0015	0.0019
Myclopentan	0.0006	0.0004	0.0005
Benzene	0.0005	0.0004	0.0005
Cyclohexane	0.0006	0.0003	0.0005
n-Heptane	0.0005	0.0001	0.0004
Myclohexane	0.0003	0.0001	0.0003
Toluene	0.0002	0	0.0001
n-Octane	0.0001	0	0.0001
H2O	0.0001	0.0011	0.0011

6.4 **Engineering**

PACKAGER shall be responsible for complete engineering of the supplied package. Following is a brief list of major engineering activities in PACKAGER's scope. This list is not meant to be an exhaustive statement of PACKAGER's engineering scope which shall still cover all engineering aspects of the PACKAGER's battery limit of supply and installation system, whether or not same is listed in the following package.

- Generator General Arrangement Drawing (including all auxiliary system, exhaust, cooling, inlet, etc.).
- Equipment placement layout.
- Cable schedules and cable sizing calculations.
- Piping / Ducting Layouts & installation details
- Single Line diagrams.
- Complete design and engineering of the Generation System's Control System including schematic drawings, wiring drawings, General arrangement drawings, logic drawings, control philosophy, interlock definition, HMI configuration, functional design specifications, HMI screen design, etc. complete in all respects.
- Detailed wiring and termination drawings of the supplied system including within-panel wiring as well as all interconnecting wiring / terminations complete in all respects.
- AC and DC Power Distribution schemes.
- As built drawings.

6.5 **Startup and Commissioning Services**

The PACKAGER/SUPPLIER shall provide the plant startup and commissioning services. The PACKAGER/SUPPLIER shall submit the estimated days (not less than twenty (20) days) for the startup and commissioning services. The PACKAGER/SUPPLIER shall submit the price for the above in commercial proposal on lump sum basis for following commissioning and startup activities:

- Pre-commissioning of supplied Generation Package equipment / system.
- Commissioning of supplied Package including controls.
- PLC (UCP) Loop testing, Checkout and commissioning.

- Start up / Site acceptance testing
- Performance Test

The PACKAGER/SUPPLIER shall provide the detailed breakup for the man days involved, personnel and their respective experience in man-hour rates format for the above services.

6.6 **Commissioning and Startup spares**

For all equipments, PACKAGER/SUPPLIER shall identify and provide spare parts list needed for commissioning and startup with the Bid as an essential requirement. PACKAGER/SUPPLIER must submit the Price breakup for each spare in commercial document.

6.7 **Two Years Operational and Maintenance Spares**

PACKAGER/SUPPLIER shall recommend and provide spare parts list needed for two (2) years operation with the Bid as an essential requirement. PACKAGER/SUPPLIER must submit the Price breakup for each spare in commercial document. The spare must be in accordance with recommendation by OEM of the supplied component. Recommended spares should take into account related factors of item's reliability, effect to equipment downtime upon production or safety, costs of parts, and availability of equipment service facilities.

All spare parts furnished by PACKAGER/SUPPLIER shall be wrapped and packaged so that they will be preserved in original as-new conditions of storage to be anticipated and shall be properly tagged and coded so that later identification as intended equipment usage would be facilitated. They shall be packaged separately, clearly marked as "Spare Parts", and shipped at the same time as the equipment. Packing lists shall be furnished so that the parts can be handled without uncrating if desired.

6.8 **On-site Training to OGDCL personnel**

The Supplier shall provide the on-site training services for operation and maintenance for all required disciplines to OGDCL personnel. The training shall include both class room and on-field modules. The Supplier shall submit the estimated days for the training. The supplier shall submit the price in commercial proposal on lump sum basis. The supplier shall provide the training details with bid document.

6.9 **Packing, Preservation and Transportation of Material & Equipment**

Packing and Preservation shall be suitable for transportation of material and equipment during their handling, inland transportation, and shipment through sea or by air and storage at site for upto 6 months in an uncovered location. Packing shall account for the fragility and physico-chemical/ mechanical damages of items. Detailed requirements for Packing & Protection of Material and Equipment are indicated in Specification No. 165-2-SPM-004.

6.10 **Inspection & Testing**

Inspection and testing shall generally comply with the requirements as detailed in this requisition documentation and in the other referenced specifications.

6.10.1 Inspection

All equipment supplied by the PACKAGER/SUPPLIER shall be subjected to inspection by OGDCL, its authorized agents and other certifying authority if required. All test certificates for materials used during fabrication shall be made available prior to final inspection. The PACKAGER/SUPPLIER shall coordinate with OGDCL or his authorized agents and conduct the inspection in accordance with the Inspection Requirements and Specified in the Tender Document.

Inspection by OGDCL does not relieve the PACKAGER/SUPPLIER of his responsibility to carry out inspection and testing as required by codes, standards and specifications.

Third party inspector will be arranged by the OGDCL through its approved inspectors and scope of the third party inspection will be provided by the CLIENT after award.

6.10.2 Factory Acceptance Test (FAT)

This will be applicable to:

- Gas Engine Generators
- Diesel Engine Generators
- SWG-001

PACKAGER/SUPPLIER shall submit detailed FAT procedures for Company's approval and shall intimate the Company of testing schedule Four (4) weeks in advance prior to actual test.

Company shall reserve the right to attend the respective FAT by deploying its own personnel or that of its authorized representative. PACKAGER/SUPPLIER shall bear all the costs for these FATs as detailed in the ITB.

6.10.3 Performance Tests

In addition to the individual equipment testing, the Performance Test for the fully functional system shall be carried out in accordance with approved procedures for a minimum period of forty eight (48) continuous hours. The Supplier shall submit such procedure for approval to Company before commencing the test. The performance test shall be carried out only if prior to the test the continuous operation of the Package or its components have been demonstrated within the operating envelop for a period of at least three (03) days.

In case of operation interruption the test shall be continued at the actual date. If this interruption is attributable to the supplier, the continuous test shall be started from the beginning again.

If the Performance Test is interrupted for reasons attributable to the supplier, The Supplier shall, at promptly reengineer and/or carry out such modifications as are required to rectify the causes of the interruption. Company will thereafter give notice in writing to the PACKAGER/SUPPLIER specifying the date on which Performance Test may be recommended.

6.11 Documentation

All Documentation requirements detailed in section 8.0 of this document and referred specifications shall be supplied by the PACKAGER/SUPPLIER.

6.12 Guarantee & Warrantees

Refer section 9.0 of this document. In addition, all related requirements mentioned in individual specifications shall also be complied with.

7.0 **DESIGN REQUIREMENTS**

7.1 **Gas Engine Driven Generators (Main Power Generation System)**

The power generation system shall consist of 1 Nos. operating & 1 No. standby 400V gas engine driven generators for the main or normal operation

The power generator sets shall be self contained units complete with reciprocating internal combustion engines, alternator, cooling system, exhaust, etc., mounted on industrial type rails / skids complete with power distribution panels for auxiliaries. The units shall be equipped for electric-start with batteries as primary means of starting generators.

Gas Engine shall be suitable for operation on raw gas composition

The gas engine driven generator sets shall be provided with acoustic canopy and shall include the following items as a minimum:

- Natural gas fueled engine
- Generator
- Engine Starter (electric)
- Fuel System
- Lube Oil Cooler
- Jacket Water Cooler (Radiator)
- Air Inlet Filters
- Exhaust Silencer with Spark Arrestor
- Expansion Joints, Elbow
- Electronic Governor
- Fuel Shutoff Valve
- Generator Main Power Terminal Box
- Generator AC Controls Terminal Box
- Generator DC Instrumentation Terminal Box
- Electrical/Instrument Devices
- Rigid Steel Skid
- Vibration Isolators
- Engine Gauge Panel
- Generator Control Panel

- Lube Oil Filter
- Voltage Regulator
- Cranking Controls
- Fire detection System for the canopies.

All equipment and components shall be furnished in accordance with technical requirements mentioned herein and in attached specifications 165-2-SPE-014.

The engine-generator shall be rated for **continuous duty** service at rated kilowatts, kilovolt-amperes, voltage, and site conditions.

Alternator shall be brushless synchronous generator.

Standard	:	IEC
Voltage	:	400V, 3-phase + Neutral
Frequency	:	50 Hz
Insulation class	:	Class F
Temperature rise	:	Class B (based on 45°C ambient temperature)

The generator sets shall be installed in the canopy in safe area under a shed. The noise limits of the total skid shall not be more than 85dB (A) at 1 meter distance from the edge of the canopy. The canopy shall be sized to have adequate free space for maintenance and shall meet requirements of IP54. The canopy shall include Fire detection system.

The selection of generator sets shall be influenced considering system reliability, uniformity and the expected impact on warehoused parts. All gas engine generators shall be identical.

The engine-generator and all auxiliaries shall be suitable for the site conditions as indicated.

7.2 **Emergency / Black Start Diesel Generator**

Essential power for the plant shall be provided by 1 No. 400V, 3 Phase, 50 Hz emergency diesel engine-driven generator.

On loss of normal power at the Essential bus bar, the emergency diesel generator shall start up automatically (with provision for manual startup selection). It shall be capable of starting, accelerating to operating speed, and carrying full load within twenty seconds after actuation of the start signal. When the generator has attained rated volts and speed, the control system will automatically close the incoming feeder and connect the generator onto the emergency bus.

The emergency diesel generator shall also be capable of starting under 'black start' conditions, when no utilities or other services are available. Hence Generator auxiliaries shall be able to operate without any external source of auxiliary supplies.

The power generator sets shall be self contained units complete with internal combustion engines, alternator, cooling system, exhaust, etc., mounted on industrial type rails / skids complete with power distribution for auxiliaries. The units shall be equipped for electric-start with batteries as primary means of starting generators.

The diesel engine driven generator set shall be provided with acoustic canopy and shall include the following items as a minimum:

- Diesel fueled engine
- Generator
- Engine Starter (electric)
- Fuel System
- Lube Oil Cooler
- Jacket Water Cooler (Radiator)
- Air Inlet Filters
- Exhaust Silencer with Spark Arrestor
- Expansion Joints, Elbow
- Electronic Governor
- Fuel Shutoff Valve
- Generator Main Power Terminal Box
- Generator AC Controls Terminal Box
- Generator DC Instrumentation Terminal Box
- Electrical/Instrument Devices
- Rigid Steel Skid
- Vibration Isolators
- Engine Gauge Panel
- Generator Control Panel
- Lube Oil Filter
- Voltage Regulator
- Cranking Controls

- Sub Base day tank for Diesel storage.
- Fire detection System for the canopy.
- Diesel Day Tank

The emergency generator shall have its own diesel tank and piping arrangement which shall assure autonomy of 12 hours operation at rated load.

Diesel engine driven alternator shall be brushless synchronous generator.

Standard	:	IEC
Voltage	:	400V, 3-phase + Neutral
Frequency	:	50 Hz
Insulation class	:	Class F
Temperature rise	:	Class B (Based on 45°C ambient temperature)

The generator set shall be installed in the canopy in safe area under the same shed used for Gas Engine Generators. The noise limits of the total skid shall not be more than 85dB (A) at 1 meter distance from the edge of the canopy. The canopy shall be sized to have adequate free space for maintenance and shall meet requirements of IP54. The canopy shall include Fire detection system.

7.3 **Switchgear (SWG-001)**

The Switchgears should be indoor type, free standing, bottom cable entry, cubicle type modular construction, and front operated.

The Switchgears & MCCs shall be designed, and constructed, as defined in IEC 60439-1 Standard, such that the failure of one equipment does not affect the adjacent units.

The Switchgears shall be minimum IP31 according to IEC 60529, gasketed, and installed in ventilated or air-conditioned electrical equipment rooms located in unclassified areas.

Each incoming breaker and BUS Coupler shall be furnished with dedicated electronic protection relay modules (EPRs) covering the minimum protection features as shown in relevant single line diagram and data sheets

The switchgears & MCCs shall be type tested for mechanical resistance test, which ensures the strength of the structure against electro dynamic forces due to short circuit currents.

Phases for buses and component terminals shall conform to IEC standards for Switchgears & MCCs. Horizontal and vertical buses shall be braced to withstand the minimum RMS symmetrical fault current, at a utilization voltage of 400 V, as specified in datasheet. Bus ratings shall be based on 40°C rise over a 50°C ambient. Bus bar spacing and the spacing of bus fastening point shall not be less than specified in IEC 60439-1. The bus bar ratings of the main buses for switchgears & MCCs shall be as per Single Line Diagrams.

7.4 **Cabling System**

PACKAGER/SUPPLIER shall be responsible to provide all cables (Auxiliaries / Power Control, instrumentation, interface / communication, etc.) required to connect, energize and operate the equipment included in the Package. Power cable from Generator output to the Switchgear Panel (SWG-001) will be provided by the Company. However, package vendor shall pre install all cable ways (trays, conduits etc) on skids.

PACKAGER/SUPPLIER shall also provide comprehensive cable schedules for each of the above application complete in all respects including cable size, type, length and termination schedules, etc. clearly mentioning the cables type for ease of installation.

Control and signaling cables shall be stranded copper conductors, Cross linked poly ethylene (XLPE) insulated, single galvanized steel wire armoured and PVC over sheathed and shall generally conform with IEC 60502-2.

All cables for outdoor installation buried or laid on cable trays will have steel wire armour construction. Cables for indoor installation laid in cable tray can be unarmored.

Supplied skids shall have grounding cable connection installed on each consumer upto a common earth plate / earth point on skid, for onward connection from skid to earth network by company.

Earthing cables shall be stranded copper conductor, PVC sheathed, coloured yellow/green.

7.5 Control System

7.5.1 General

PACKAGER/SUPPLIER shall furnish a control system for Power Generation Package for control (automatic with manual override), monitoring, alarm, and safety of Generators and allied breakers and Bus couplers complete in all respects.

7.5.2 Functional Requirements

Control System to be furnished by PACKAGER/SUPPLIER shall provide following major functions. (Detailed requirements for the listed items are mentioned in attached specifications)

- Engine Monitoring, Alarms and Protection.
- Alternator Protections through Electronic multifunction relays.
- Generator metering for electrical parameters (voltages, currents, kwh, kVA-hr, Pf, etc.)
- Genset Control functions including Manual / Auto Start / Stop, Remote Start-Stop, Emergency Stops, etc.
- Temperature monitoring.
- Electronic Governor.
- Display and annunciation panel.
- Automatic Voltage Regular and reference adjustment.
- Automatic / Manual paralleling of all generators including:
 - Synchronizing with dead bus arbitration.
 - Automatic starting / stop sequence control including load sense / load demand logic.
 - Automatic load & VAR sharing.
 - Generator Available signaling / command.
 - Generator unavailable signaling.

- Generator breaker and bus coupler automatic control.
- Interlocks between generator circuit breaker and bus couplers breakers on Main LV bus (SWG-001).
- Facility of manual operation of all the above mentioned functions from the panel mounted module.

7.5.3 Control System (Panels Description)

Control System shall comprise of individual Unit Control Panel (UCP) for each of the Gensets (Gas Engine & Diesel Engine).

Each UCP shall incorporate control, monitoring, alarm and safety functions of individual engine-generator sets.

In addition to UCP, Packager's control system shall also incorporate following.

- Generator synchronizing operation and lead bus arbitration.
- Automatic generator starting / sequencing / stop.
- Automatic load transfer.
- Automatic load & VAR sharing.
- Interlocks between generator breakers and breakers / bus couplers on Main Busbar.
- Scanning of individual generator availability

UCPs and any other control module shall be integrated through high speed LAN or Vendor's proprietary communication network.

PACKAGER/SUPPLIER shall be responsible for complete integration of the supplied control system complete in all respects including all software / hardware requirements and communication / networking equipment.

Supplied system shall preferably be operated through panel mounted Displays.

7.5.4 List of Minimum Engine-Generator Protections

Engine Monitoring

- Coolant temperature
- Oil pressure
- Engine speed (RPM)
- Battery voltage
- Run hours
- Crank attempt and successful start counter

Engine Protection

- Control switch not in auto (alarm)
- High coolant temp (alarm and shutdown)
- Low coolant temp (alarm)
- Low coolant level (alarm)
- High engine oil temp (alarm and shutdown)
- Low, high, and weak battery voltage
- Overspeed
- Overcrank
- Low fuel level (alarm)
- Low oil pressure (alarm)

Generator Monitoring

- Voltage (L-L, L-N)
- Current (Phase)
- Average Volt, Amp, Frequency
- kW, kVAr, kVA (Average, Phase, %)
- Power Factor (Average, Phase)

- kW-hr, kVAr-hr (total)
- Excitation voltage and current (with CDVR)
- Generator stator and bearing temp (with optional module)+

Generator Protection

- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under frequency (81 O/U)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)
- Negative Phase Sequence Relay (46)
- Check Synchronizing Relay (25)
- Field Failure (loss of excitation) Relay (40)
- Machine thermal Relay (49)
- Earth Fault Relay (64)

7.6 **Equipment Tagging, Labeling & Nameplates**

All items need to be identified for operation and maintenance purposes, therefore, shall be allocated with tag numbers. The PACKAGER/SUPPLIER shall provide list of all equipment, instrumentation, etc to the Company. Company shall provide tag nos. for these items to the PACKAGER/SUPPLIER. PACKAGER/SUPPLIER must indicate these numbers on all design documents. All tagged items shall have corrosion resistant nameplates or labels permanently attached which shall include PACKAGER/SUPPLIER's standard identification and together with the Company's tag number. All other control and indication devices that operators will need to access/maintain shall have corrosion resistant identification/duty labels permanently attached.

7.7 Package Cleaning

Prior to shipment the package shall be subject to thorough cleaning by the PACKAGER/SUPPLIER. The PACKAGER/SUPPLIER shall give recommendation for the package cleaning. The package cleaning program shall be agreed with the Company. As a general rule the PACKAGER/SUPPLIER shall clean the package internals in the workshop prior to preparation for shipping. PACKAGER/SUPPLIER shall ensure that the equipment is free from any foreign material, dirt, etc.

8.0 DOCUMENTATION

8.1 Use of the English Language

All documents shall be written in the English Language.

8.2 Documents requirement

The PACKAGER/SUPPLIER must provide the following documents as minimum at different stages of Project as mentioned in the Table below.

PACKAGER/SUPPLIER shall also refer to Documentation requirements mentioned in attached specifications and shall ensure compliance with the same.

Comments / Deviations / Exceptions taken by the PACKAGER/SUPPLIER with respect to codes, standards and this specification shall be explained with technical justification for company's evaluation; if no deviation is specifically listed it would deem to have been accepted by the bidder.

No.	Documents & Drawings	At Bid	For Approval	As-Built
			After LOI	
1.	Pre-Commissioning, Commissioning & Start-up Spare Parts List	√	√	√
2.	Operational Spares List	√	√	√
3.	Special Tool List (Install / Start up / Maintenance if any)	-	√	√
4.	Operational Consumables List	-	√	√
5.	Generator Data Sheets	√	√	√
6.	OEM Catalog/Data Sheet/Specifications	√	√	√
7.	Switchgear OEM Catalog/Data Sheet	√	√	√

No.	Documents & Drawings	At Bid	For Approval	As-Built
			After LOI	
8.	Single Line Diagrams with all Protections & Interlocks	-	√	√
9.	Dimension & Weight of all equipment	√	√	√
10.	Control System Schematic/Block diagram	√	√	√
11.	Control Panel OEM Spec Sheets	√	√	√
12.	Control Philosophy & Interlock definition	-	√	√
13.	UCP Wiring Diagram	-	√	√
14.	Communication Signal List (Mod-bus List)	-	√	√
15.	List of UCP related software and hardware devices with spec sheets.	-	√	√
16.	Fuel Consumption Data & require Fuel Pressure	√	√	√
17.	Cable Spec Sheet	-	√	√
18.	Interface/ Tie-in list at Battery Limits	-	√	√
19.	Loading Data for Civil Foundation Design		√	√
20.	Canopy Specification	√	√	√
21.	Switchgear Fabrication / Shop Drawings	-	√	√
22.	Control System Wiring / Termination Drawings	-	√	√
23.	Cable Schedule for Auxiliary Loads	-	√	√
24.	Cable Schedule for Instrumentation Control Interface	-	√	√
25.	Equipment Schedule	-	√	√
26.	Tagging Lists	-	√	√
27.	Equipment Installation Drawings	-	√	√
28.	Delivery Schedule	√	√	√
29.	Installation Manuals	-	√	√
30.	Pre-Commissioning, Commissioning Manuals	-	√	√
31.	Test Certificates / Test Reports	-	√	√
32.	Operation & Maintenance Manual / Dossier	-	√	√
33.	Training Manuals	-	√	√

8.3 Document Sizes

Sizes A1, A2, A3, and A4 shall be used.

NB. A0 size drawings are NOT acceptable.

8.4 **Quantities of Documents Required**

- A4 Size: 4 Copies (for review & approval)
- A3 Size: 4 Copies (for review & approval)
- A2, A1 Size: 4 folded size for A4 size prints
- Manuals (Startup & Operation Manuals, Job Books, Equipment Dossier, etc.): 2 copies for review. 6 copies at final issue
- Certification & Manufacturing Data Records: 6 copies at final issue

8.5 **Electronic Data**

PACKAGER/SUPPLIER shall also submit electronic/soft copies of all design data, documents, drawing, etc. This also includes design details by PACKAGER/SUPPLIER's Sub-Suppliers. The PACKAGER/SUPPLIER shall transmit final documentation on CDs. All drawings shall be prepared in AutoCAD format. All documentation shall be prepared in MS Office.

8.6 **Manuals**

Manuals shall be submitted in clearly labeled 4 ring white hard cover binders. All documents smaller than A4 shall be inserted into A4 pre-punched, top-opening plastic wallets (if original certification, etc.) or attached to A4 sheets. Documents larger than A4 shall be folded to A4 size and inserted into A4 pre-punched, top-opening plastic wallets with the project document number/title block clearly visible to the front.

9.0 **GUARANTEE & WARRANTY**

- 9.1 Supplier guarantees that each item provided will be free of defects in design, material and workmanship. The guarantee shall apply to discrepancies and defects that are discovered within the shorter of 12 months after final acceptance, or 18 months after being received at the jobsite. If corrective work is performed on an item under this guarantee, the guarantee shall also apply to discrepancies and defects in the corrective work that are discovered within the shorter of 12 months after the corrected item is again placed in operation, or 18 months after completion of the corrective work. These guarantee terms shall be extended for any period that an item cannot be operated as a result of discrepancies or defects in any item.

9.2 In addition, PACKAGER/SUPPLIER shall disclose to company each proposed design, manufacturing procedure, material, component, or assembly which does not have at least 2 years' satisfactory field-operating experience in similar service. If PACKAGER/SUPPLIER fails to make such disclosure to Company in writing prior to accepting a purchase order, the warranty shall be extended for 2 additional years beyond that specified above, and the warranty obligations shall be expanded to include payment of all direct costs to Company that may result from the use of such procedures, materials, components, or assemblies. Direct costs include, but are not limited to the following:

- Replacement parts
- Field labor required for removal and re-installation
- Factory labor to complete repair
- Shipping and freight
- Inspection and testing

Alternately, Company reserves the right to reject the item of equipment. If Company elects this option, Supplier shall bear all costs to provide equipment having two years' satisfactory operating experience in similar service.

PREFERRED VENDOR LIST



Zishan Engineers (Pvt.) Ltd.

An ISO 9001-2015 certified company,
47/F, Block 6, PECHS, Karachi-Pakistan
Tel: (92-21) 34393045-48 & 34310151-54
Fax: (92-21) 34533430 & 34310156
E-mail : contact@zishanengineers.com
Web : www.zishanengineers.com

Document No. 165-2-SPG-033

Revision 0

Date 23-10-2018

Total Pages (inc front cover) 4



OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMEN PROJECT

PREFERRED VENDOR LIST (POWER GENERATION)



Rev.	Date	Description	Prepared By	Checked By	Approved By
0	23-10-2018	Issed for Tender	MF	NAK	MIAH

OIL & GAS DEVELOPMENT COMPANY LTD.
SUPPLY & COMMISSIONING OF
POWER GENERATION SYSTEM & ALLIED EQUIPMENT
PREFERRED VENDOR LIST

DESCRIPTION	NAME	COUNTRY
GAS ENGINES	WAUKESHA	INTERNATIONAL
	JANBACHER	INTERNATIONAL
	CATERPILLAR	INTERNATIONAL
	WARTSILA	INTERNATIONAL
DIESEL ENGINES	CATERPILLAR	INTERNATIONAL
	DETROIT DIESEL	INTERNATIONAL
	PERKINS	INTERNATIONAL
	CUMMINS	INTERNATIONAL
	MTU	INTERNATIONAL
LV SWITCHGEAR	WAUKESHA	INTERNATIONAL
	GENERAL ELECTRIC	PAKISTAN
	SIEMENS	PAKISTAN
	ABB	PAKISTAN
PROTECTION RELAYS	SCHNEIDER ELECTRIC	FRANCE / PAKISTAN
	ABB	GERMANY
	ALLEN BRADLEY	GERMANY
	GENERAL ELECTRIC	USA
	SCHNEIDER ELECTRIC	FRANCE
CONTROL CABINETS	SIEMENS	INTERNATIONAL
	RITTAL	GERMANY
POWER & CONTROL CABLES	A.G.E. INDUSTRIES (PVT) LTD.	PAKISTAN
	NEWAGE CABLES	PAKISTAN
	PAKISTAN CABLES	PAKISTAN
	FAST CABLES	PAKISTAN
	SAUDI CABLE	SAUDI ARABIA
	PIRELLI	ITALY / UK
	OMAN CABLES	OMAN
	AEI	UK
LIGHTING FIXTURES (EX-PROOF)	PIONEER CABLES	PAKISTAN
	HUBBEL / KILLARK	INTERNATIONAL
	CEAG CROUSE-HINDS	INTERNATIONAL
	TECHNOR - ITALSMEA	ITALY
	CLIPSAL Ex	AUSTRALIA
	FEAM	UK
	ATX	FRANCE
	R.STAHL	GERMANY
LIGHTING FIXTURE (NON-Ex)	VICTOR	USA
	PHILIPS	GERMANY / PAKISTAN
	PIERLITE	AUSTRALIA
	FAEBER	ITALY
	C - LUCE	ITALY

OIL & GAS DEVELOPMENT COMPANY LTD.
SUPPLY & COMMISSIONING OF
POWER GENERATION SYSTEM & ALLIED EQUIPMENT
PREFERRED VENDOR LIST

DESCRIPTION	NAME	COUNTRY
BATTERY CHARGES DIRECT CURRENT	CEG ELETTRONICA INDUSTRIALE S.R.I	ITALY
	CHLORIDE	FRANCE
	GUTOR	SWITZERLAND
	APC	UK / USA
	SAFT	FRANCE
EARTHING & LIGHTING PROTECTION ACCESSORIES	ERICO	USA
	FURSE	UK
	LPI	AUSTRALIA
COMBUSTIBLE & TOXIC GAS DETECTOR	ALCATEL LUCENT	FRANCE
	GENERAL MONITORS	USA / IRELAND / SINGAPORE
	DET-TRONICS	USA
	ZELLWAGER	USA / UK
	HONEYWELL	INTERNATIONAL
	DRAGER	GERMANY
FLAME DETECTORS	COOPER LIGHTING AND SECURITY LTD.	UK
	GENERAL MONITOR	USA / IRELAND / SINGAPORE
	DET-TRONICS	USA
	THORN SECURITY	UK
	FIRE EYE	USA
	DRAGER	GERMANY
	HONEY WELL	INTERNATIONAL / USA
ESD PUSH-BUTTONS	CEAG	UK
	ABB ENTRELEC	SWITZERLAND
	HONEYWELL	INTERNATIONAL
	R. STAHL	GERMANY
INSTRUMENT CABLES	BATT	UK
	DRAKA	HOLLAND
	OMAN CABLE	OMAN
	BELDEN	USA
	BICC CABLES	UK
	PIRELLI	ITALY
	ERSE CABLO	TURKEY
	KERPEN	GERMANY
TERMINAL BLOCKS	WEIDMULLER KLIPPON	UK / USA / NETHERLAND
	ABB ENTRELEC	SWITZERLAND
	PHOENIX	USA / UK / SINGAPORE

OIL & GAS DEVELOPMENT COMPANY LTD.
SUPPLY & COMMISSIONING OF
POWER GENERATION SYSTEM & ALLIED EQUIPMENT
PREFERRED VENDOR LIST

DESCRIPTION	NAME	COUNTRY
CABLE GLANDS	CLIPSAL	AUSTRALIA
	ATX	FRANCE
	CMP	UNITED KINGDOM
	COOPER CAPRI	IRELAND
	CORTEM	ITALY
	HAWKE INTERNATIONAL	UK
	PEPPERS CABLE GLANDS LTD.	UK
	CROUSE HINDS / COOPER INDUSTRIES	USA
	R.STAHL	GERMANY
JUNCTION BOXES	CHALMIT	UK
	ATX	FRANCE
	CEAG CROUSE-HINDS	GERMANY
	R. STAHL	GERMANY
	GOVAN	AUSTRALIA
	EMERSON	USA
	KILLARK	USA
	HAWKE INTERNATIONAL	UK
TECHNOR - ITALSMEA	ITALY	

NOTE:

1. As part of the Bid the Supplier/Packager shall include his list of proposed Suppliers, Sub-contractors and Process Licensors. The list above contains the names of OGDCL recommended companies; Supplier/Packager to submit his proposed list with the Bid. Any Suppliers/Vendors other than from the Preferred Vendor List shall require OGDCL's approval.



OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

TENDER NO. _____

TENDER DOCUMENTS

FOR

SUPPLY & COMMISSIONING OF POWER GENERATION SYSTEM

& ALLIED EQUIPMENT PACKAGE

(VOLUME – III)



Submitted By:



Zishan Engineers (Pvt.) Ltd.

An ISO 9001-2015, 14001-2004 & 18001-2007 certified company

TABLE OF CONTENTS**VOLUME-III****DATASHEET:**

1. 165-2-DSE-001 Data Sheet for Gas Engine Generator Sets
2. 165-2-DSE-002 Data Sheet for Diesel Engine Generator Set (G-02)

DRAWING:

1. 165-2-ELS-001 Key Single Line Diagram

SPECIFICATIONS:**Electrical Specifications:**

1. 165-2-SPE-013 General Specifications for Motors
2. 165-2-SPE-014 Technical Specification for Gas Engine Generators
3. 165-2-SPE-015 Specification for Diesel Engine Generators
4. 165-2-SPE-017 Specifications for Low Voltage Switchgear

General Specification:

1. 165-2-SPG-029 Specification for Site Environmental Conditions

DATA SHEETS



Zishan Engineers (Pvt.) Ltd.

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Web : www.zishanengineers.com

Document No.	165-2-DSE-001
Revision	0
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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

DATA SHEET FOR GAS ENGINE GENERATOR SETS



0	23-10-2018	Issued for Tender	MF	NAK	MIAH
Rev.	Date	Description	Prepared By	Checked By	Approved By

Consultant		Data Sheet			
 ZISHAN ENGINEERS (PVT.) LTD.		DATA SHEET FOR GAS ENGINE GENERATOR SETS			
		Document No.		Revision	DATE
Client		165-2-DSE-001		0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.		Prepared By	Checked By	Approved By	SHEET
		MF	NAK	MIAH	2 OF 7

GAS ENGINE

SITE CONDITIONS

Ambient Temp.(°F)	Minimum	30	Maximum	112	Humidity:	61%	Altitude (ft):	1900 AMSL
Area Classification:	<input type="checkbox"/> Hazardous		<input checked="" type="checkbox"/> Non-hazardous		<input type="checkbox"/> Other			
Atmosphere:	<input type="checkbox"/> Desert		<input type="checkbox"/> Marine		<input checked="" type="checkbox"/> Corrosive		<input type="checkbox"/> Non-Corrosive	
Siesmic Zone:	Zone-2B							
Wind Velocity:	<input checked="" type="checkbox"/> Maximum 100 mi/hr							
	<input type="checkbox"/> Others							

CHARACTERISTICS

ASPIRATION:	TYPE OF FUEL:	NATURAL GAS	SERVICE:	CONTINUOUS DUTY
--------------------	----------------------	-------------	-----------------	-----------------

CONSTRUCTION

MANUFACTURING STANDARDS:

MAKE:

TYPE/MODEL:

NUMBER OF CYLINDERS:	<input type="checkbox"/> IN LINE:	<input type="checkbox"/> V:	NO. OF CYCLES:
-----------------------------	-----------------------------------	-----------------------------	-----------------------

BORE (MM):

STORKE (MM):

DISPLACEMENT (CM3):

OPERATING CYCLES:

COMPRESSION RATIO:

PRESSURE CHARGED:	<input type="checkbox"/> YES	<input type="checkbox"/> NO
--------------------------	------------------------------	-----------------------------

DIRECTION OF ROTATION FACING FLY WHEEL:

COOLING:	<input type="checkbox"/> AIR	<input checked="" type="checkbox"/> WATER COOLED
-----------------	------------------------------	--

BASEPLATE:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> SEPARATED	<input checked="" type="checkbox"/> COMBINED WITH DRIVEN EQUIPMENT
-------------------	---	-----------------------------	------------------------------------	--

STARTING

STARTING EQUIPMENT:	<input checked="" type="checkbox"/> ELECTRIC	<input type="checkbox"/> AIR	<input type="checkbox"/> 24 V DC	<input type="checkbox"/> OTHER
----------------------------	--	------------------------------	----------------------------------	--------------------------------

AIR COMPRESSOR:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	<input type="checkbox"/> CAPACITY (NM3/HR)
------------------------	------------------------------	--	--

<input type="checkbox"/> DRIVEN BY:	<input type="checkbox"/> WORKING PRESSURE:
-------------------------------------	--

<input type="checkbox"/> MAKE & TYPE:

<input type="checkbox"/> WORKING PRESSURE REDUCING VALVE:

COOLING

ENGINE COOLING SYSTEM:	<input type="checkbox"/> AIR	<input checked="" type="checkbox"/> WATER	<input type="checkbox"/> OPEN	<input checked="" type="checkbox"/> CLOSED
-------------------------------	------------------------------	---	-------------------------------	--

FAN DRIVE:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> FOR SUCTION	<input type="checkbox"/> PUSHER
-------------------	---	-----------------------------	--------------------------------------	---------------------------------

TYPE OF DRIVE:

WATER PUMP:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
--------------------	---	-----------------------------

OIL COOLER:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> SEPARATED	<input type="checkbox"/> COMBINED
--------------------	---	-----------------------------	------------------------------------	-----------------------------------

INTERCOOLER FOR PRESSURE CHARGER:	<input type="checkbox"/> YES	<input type="checkbox"/> NO
--	------------------------------	-----------------------------

FILTERING

FUEL FILTER:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> SINGLE	<input checked="" type="checkbox"/> DUPLEX
---------------------	---	-----------------------------	---------------------------------	--



AIR FILTER:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO		
--------------------	---	-----------------------------	--	--

COMBINED WITH CYCLONE TYPE:	<input type="checkbox"/> YES	<input type="checkbox"/> NO
------------------------------------	------------------------------	-----------------------------



OIL FILTER:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> SINGLE	<input checked="" type="checkbox"/> DUPLEX	<input type="checkbox"/> BYPASS
--------------------	---	-----------------------------	---------------------------------	--	---------------------------------

<input type="checkbox"/> FULL FLOW

MAGNETIC FILTER:	<input type="checkbox"/> YES	<input type="checkbox"/> NO
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Consultant		Data Sheet		
 ZISHAN ENGINEERS (PVT.) LTD.		DATA SHEET FOR GAS ENGINE GENERATOR SETS		
		Document No.	Revision	DATE
Client		165-2-DSE-001	0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.		Prepared By	Checked By	Approved By
		MF	NAK	MIAH

GAS ENGINE											
OPERATING CONDITIONS											
POWER REQUIRED:		VTS ACCORDING TO GENERATOR OUTPUT POWER (SHEET 4 OF 6)									
POWER (KW):	<input type="checkbox"/>	NORMAL:	<input type="checkbox"/>	RATED:							
SPEED (RPM):	<input type="checkbox"/>	NORMAL:	<input type="checkbox"/>	RATED:							
PERFORMANCE											
		POWER (KW)			SPEED (RQM)						
		MIN.	MAX.			MIN.	MAX.				
CONTINUOUS RATING TO DIN 6270											
RATING "B" TO DIN 6270											
SHORT TIME RATING TO DIN 70020											
SHOP TEST											
RUNNING PERFORMANCE:	<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO							
MECHANICAL RUNNING:	<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO							
OTHERS:											
WEIGHTS											
ENGINE (KG):					ACCESSORIES (KG):						
INSTRUMENTATION											
INSTRUMENT AND STARTING PANEL:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>	ON ENGINE FRAME				
PANEL MOUNTING:		<input checked="" type="checkbox"/>	ANTI VIBRATION								
TECHOMETER:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ELECTRICAL	<input type="checkbox"/>	MECHANICAL		
PRESSURE INDICATOR:		<input checked="" type="checkbox"/>	ON OIL	<input type="checkbox"/>	ON COOLING WATER	<input type="checkbox"/>	AFTER FILTER	<input type="checkbox"/>	BEFOR FILTER		
TEMPERATURE INDICATOR:		<input checked="" type="checkbox"/>	ON OIL	<input checked="" type="checkbox"/>	ON COOLING WATER	<input checked="" type="checkbox"/>	AFTER FILTER	<input checked="" type="checkbox"/>	BEFOR FILTER		
EXHAUST TEMPERATURE MEASUREMENT:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
BATTERY CHARGING INDICATOR:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	PANEL MOUNTED				
PRESSURE CHARGED											
PRESSURE CHARGER:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	TURBO	<input type="checkbox"/>	ROOTS	TYPE	
EXHAUST SILENCE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>	HOSPITAL GRADE	<input type="checkbox"/>	OTHER		
EXHAUST MANIFOLD:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
PREOILING PUMP		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
BATTERY CHARGING											
RECTIFIER:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
INPUT:	400 VAC ± 10%	AMPS.	COS PHI=0.8 LAGGING				50 HZ. ± 2 HZ.				
OUTPUT:	24 VDC ± 1%	AMPS.									
VOLTAGE, CURRENT RELAYS:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
BATTERIES:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>	NI-CD.	<input type="checkbox"/>	LEAD ACID (VRLA)	<input type="checkbox"/>	OTHER
VOLTMETER (BOTH INPUT & OUTPUT):		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
AMMETER (BOTH INPUT & OUTPUT):		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
RECTIFIER ON/OFF SWITCH:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO						
SAFETY DEVICES											
LOW OIL PRESSURE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
HIGH ENGINE OIL TEMPERATURE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
HIGH WATER TEMPERATURE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
OVERSPEED:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
LOW WATER LEVEL		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
OVER CRANKING (START FAILURE):		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
EMERGENCY STOP:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
INTAKE AIR SHUT OFF VALVE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
SAFETY GUARDS:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input checked="" type="checkbox"/>	SHUTDOWN		
FUEL GAS PRESSURE:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
KNOCK-OUT POT LEVEL HIGH:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
MANUAL LOCKOUT AT SKID		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
FIRE DETECTORS:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
ENGINE VIBRATION		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		
COOLER VIBRATION:		<input checked="" type="checkbox"/>	YES	<input type="checkbox"/>	NO	<input checked="" type="checkbox"/>	ALARM	<input type="checkbox"/>	SHUTDOWN		

Consultant		Data Sheet		
 ZISHAN ENGINEERS (PVT.) LTD.		DATA SHEET FOR GAS ENGINE GENERATOR SETS		
		Document No.	Revision	DATE
Client		165-2-DSE-001	0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.		Prepared By	Checked By	Approved By
		MF	NAK	MIAH

SYNCHRONOUS ALTERNATORS

SITE CONDITIONS

Ambient Temp.(°F)	Minimum 30	Maximum 112	Humidity: 61%	Altitude (ft): 1900 AMSL
Area Classification:	<input type="checkbox"/> Hazardous	<input checked="" type="checkbox"/> Non-hazardous	<input type="checkbox"/> Other	
Atmosphere:	<input type="checkbox"/> Desert	<input type="checkbox"/> Marine	<input checked="" type="checkbox"/> Corrosive	<input type="checkbox"/> Non-Corrosive
Sismic Zone:	Zone-2B			
Wind Velocity:	<input checked="" type="checkbox"/> Maximum 100 mi/hr			
	<input type="checkbox"/> Others			

CHARACTERISTICS

UTILISATION: PRIME MOVER	SERVICE: CONTINUOUS
USEFUL POWER (KW): 600	
APPARENT POWER (KVA):	POWER FACTOR = 0.8
SYNCHRONOUS SPEED (RPM): VTS	FREQUENCY (HZ): 50
VOLTAGE (V): 400	NUMBER OF PHASE: 3 WIRE: 4
DRIVING MACHINE: GAS ENGINE	NEUTRAL GROUNDING : Solid grounding
COUPLING:	SHAFT AND DIAMETER:
DIRECTION OF ROTATION AT THE COUPLING END:	SHAFT HEIGHT:
PARALLEL OPERATION: YES	
EXCITATION: AS PER SPECIFICATION	COOLING METHOD: (IC6 A1 A6)
AUTOMATIC VOLTAGE REGULATION: YES	HEATING CLASS:
FIRE PROTECTION: AS PER SPECIFICATION	MAXIMUM PERMISSIBLE VOLTAGE DIP.: 15%

TYPE

PROTECTION: WEATHER PROOF	(IN ACCORDANCE WITH IEC 529)
GAS EXPLOSING PROOFING:	(IN ACCORDANCE WITH IEC 79.1)
SUBDIVISION (A, B OR C):	(IN ACCORDANCE WITH IEC 79.1)
TEMPERATURE (T1 TO T6):	(IN ACCORDANCE WITH IEC 79.1)
ENHANCED SAFETY:	(IN ACCORDANCE WITH IEC 79.7)
INTERNAL OVERPRESSURE:	(IN ACCORDANCE WITH IEC 79.2)

STATOR

CASING ORIENTATION (H OR V): HORIZONTAL	BEARING TYPE: BALL / ROLLER
MOUNTING: SKID	PRESTRESSED ROLLING:
INSULATION CLASS: F	SMOOTH:
WINDING CONNECTION: STAR 4 WIRE	INSULATED:
TEMPERATURE DETECTORS: YES (PT-100 TYPE)	ANTI-CONDENSATION HEATER: YES @ 230 V AC

ROTOR

WINDING MATERIAL: COPPER	COOLING METHOD: (IC6 A1 A6)
INSULATION CLASS: F	

EXCITATION



SEPARATE EXCITER: BRUSHLESS TYPE	ONE END OF SHAFT:	EXCITER INSULATION CLASS: F
SOLID STATE EXCITATION:	EXTERNAL:	ROTATING DIODES:

SAFETY DEVICES

ALTERNATOR REVERSE POWER / REVERSE REACTIVE POWER :	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
ALTERNATOR EARTH FAULT RELAY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
SHORT CIRCUIT:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
OVER / UNDER VOLTAGE / FREQUENCY	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
ALTERNATOR DIFFERENTIAL RELAY:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
OVERCURRENT:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
MACHINE THERMAL RELAY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
CHECK SYNCHRONIZING RELAY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
FIELD FAILURE (LOSS OF EXCITATION)RELAY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
NEGATIVE PHASE SEQUENCE RELAY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

TERMINAL BOXES

TYPE: IP65	POSITION SEEN FROM ALTERNATOR END (RIGHT, LEFT OR TOP):		
INPUT: CABLE GLANDS (BRASS)	CABLE:	TBA	
OUTSIDE DIAMETER:	DIA. ON ARMOUR:		DIA. UNDER ARMOUR:

Consultant		Data Sheet		
 ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR GAS ENGINE GENERATOR SETS			
	Document No.		Revision	DATE
Client	165-2-DSE-001		0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET
	MF	NAK	MIAH	6 OF 7
SYNCHRONOUS ALTERNATORS				
IDENTIFICATION PLATE				
METAL:	316L STAINLESS STEEL			
PAINTWORK				
TYPE:	COLOUR:	SUPPLIER:		
TESTS				
TESTS:	AS PER SPECIFICATION			
MANUFACTURER'S DATA				
NAME:				
ALTERNATOR TYPE/MODEL:				
RATED POWER (KW):				
RATED POWER (KVA):				
COS PHI (POWER FACTOR):				
RATED CURRENT:				
ALLOWABLE OVERLOAD(%):				
EFFICIENCY AT COS PHI = 1 AT FULL LOAD:		3/4 LOAD:	1/2 LOAD:	1/4 LOAD:
EFFICIENCY AT COS PHI = 0.8 AT FULL LOAD:		3/4 LOAD:	1/2 LOAD:	1/4 LOAD:
VOLTAGE REGULATOR TYPE:				
BEARINGS MAKE & TYPE:		LUBRICANT:		
REACTANCES				
SYNCHRONOUS:	LONGITUDINAL (XD):	TRANVERSE (XQ):		
TRANSIENT:	LONGITUDINAL (X'D):	TRANVERSE (X'Q):		
SUBTRANSIENT:	LONGITUDINAL (X''D):	TRANVERSE (X''Q):		
NEGATIVE SEQUENCE REACTANCE (X2):				
ZERO SEQUENCE REACTANCE (X0):				
RESISTANCE PER ROTOR WINDING:				
TIME CONSTANTS				
LONGITUDINAL TRANSIENT OFF-LOAD (T'DO):				
LONGITUDINAL SUBTRANSIENT OFF-LOAD (T''DO):				
TRANVERSE OFF-LOAD ((TQO):				
SHORT CIRCUIT CURRENTS				
SUBTRANSIENT:	TRANSIENT:	SYNCHRONOUS:		
VOLTAGE:		POWER:		
ENCLOSURE				
DRIP PROOF:	<input checked="" type="checkbox"/>	WEATHER PROOF:	YES <input checked="" type="checkbox"/>	SEE SPECIFICATION:
STRUCTURAL FRAME:	<input checked="" type="checkbox"/>	HOT DIP GALVANIZED STEEL <input type="checkbox"/>	STAINLESS STEEL <input type="checkbox"/>	POWDER PAINT COATED SHEET STEEL <input checked="" type="checkbox"/>
WEIGHTS				
STATOR:	CONTROL PANELS			
ROTOR:				
FLYWHEEL:				
ENGINE GENERATOR SKID:				
INSTRUMENT TRANSFORMERS				
CURRENT TRANSFORMER DIFFERENTIAL PROTECTION	<input checked="" type="checkbox"/>	CLASS 5 P20		
CURRENT TRANSFORMER DIFFERENTIAL METERING	<input checked="" type="checkbox"/>	CLASS 1		
CURRENT TRANSFORMER GENERAL PROTECTION	<input checked="" type="checkbox"/>	CLASS 5 P10		



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Document No.	165-2-DSE-002
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Date	23-10-2018
Total Pages (inc front cover)	7





OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

DATA SHEET FOR DIESEL ENGINE GENERATOR SET



0	23-10-2018	Issued for Tender	MF	MM	MIAH
Rev.	Date	Description	Prepared By	Checked By	Approved By

Consultant		Data Sheet			
 ZISHAN ENGINEERS (PVT.) LTD.		DATA SHEET FOR DIESEL ENGINE GENERATOR SET			
		Document No.		Revision	DATE
Client		165-2-DSE-002		0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.		Prepared By	Checked By	Approved By	SHEET
		MF	NAK	MAH	2 OF 7

DIESEL ENGINE

SITE CONDITIONS						
Ambient Temp.(°F)	Minimum	30	Maximum	112	Humidity: 61%	Altitude (ft): 1900 AMSL
Area Classification:	<input type="checkbox"/> Hazardous		<input checked="" type="checkbox"/> Non-hazardous		<input type="checkbox"/> Other	
Atmosphere:	<input type="checkbox"/> Desert		<input type="checkbox"/> Marine		<input checked="" type="checkbox"/> Corrosive	<input type="checkbox"/> Non-Corrosive
Siesmic Zone:	Zone-2B					
Wind Velocity:	<input checked="" type="checkbox"/> Maximum 100 mi/hr					
	<input type="checkbox"/> Others					



CHARACTERISTICS								
Aspiration:	Turbo Charged		Type of Fuel:	Diesel		Service:	Continuous Duty	



CONSTRUCTION						
Manufacturing Standards:						
Make:						
Type/Model:						
Number of Cylinders:	<input type="checkbox"/> In line:		<input type="checkbox"/> V:		No. of Cycles:	
Bore (mm):						
Storke (mm):						
Displacement (cm3):						
Operating Cycles:						
Compression Ratio:						
Pressure Charged:	<input type="checkbox"/> Yes		<input type="checkbox"/> No			
Direction of rotation facing Fly Wheel:						
Cooling:	<input type="checkbox"/> Air		<input checked="" type="checkbox"/> Water Cooled			
Baseplate:	<input checked="" type="checkbox"/> Yes		<input type="checkbox"/> No	<input type="checkbox"/> Separated	<input checked="" type="checkbox"/>	Combined with driven equipment

STARTING					
Starting Equipment:	<input checked="" type="checkbox"/> Electric		<input type="checkbox"/> Air	<input checked="" type="checkbox"/> 24 V DC	<input type="checkbox"/> Other
Air Compressor:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Capacity (Nm ³ /hr)	
	<input type="checkbox"/> Driven By:			<input type="checkbox"/> Working Pressure:	
	<input type="checkbox"/> Make & Type:				
	<input type="checkbox"/> Working Pressure Reducing Valve:				

COOLING					
Engine Cooling System:	<input type="checkbox"/> Air		<input checked="" type="checkbox"/> Water	<input type="checkbox"/>	<input checked="" type="checkbox"/> Closed
Fan Drive:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> For Suction	<input type="checkbox"/> Pusher	
Type of Drive:					
Water Pump:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
Oil Cooler:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Separated	<input type="checkbox"/> Combined	
Intercooler for Pressure Charger:	<input type="checkbox"/> Yes	<input type="checkbox"/> No			

FILTERING					
Fuel Filter:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Single	Duplex	
Air Filter:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			
	Combined with cyclone type:		<input type="checkbox"/> Yes	No	
Oil Filter:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Single	<input checked="" type="checkbox"/> Duplex	<input type="checkbox"/> Bypass
	<input type="checkbox"/> Full Flow				
Magnetic Filter:	<input type="checkbox"/> Yes	<input type="checkbox"/> No			

Consultant		Data Sheet								
 ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR DIESEL ENGINE GENERATOR SET									
	Document No.		Revision	DATE						
Client	165-2-DSE-002		0	23-10-2018						
 OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET						
	MF	NAK	MIAH	3 OF 7						
DIESEL ENGINE										
OPERATING CONDITIONS										
Power required:										
Power (kW):	<input type="checkbox"/>	Normal:	<input type="checkbox"/>	Rated:						
Speed (rpm):	<input type="checkbox"/>	Normal:	<input type="checkbox"/>	Rated:						
PERFORMANCE										
	Power (kW)		Speed (rpm)							
	Min.	Max.	Min.	Max.						
Continuous rating to DIN 6270										
Rating "B" to DIN 6270										
Short time rating to DIN 70020										
SHOP TEST										
Running Performance:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Mechanical running:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Others:										
WEIGHTS										
Engine (kg):	Accessories (kg):									
INSTRUMENTATION										
Instrument and Starting Panel:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	On engine frame				
Panel mounting:	<input checked="" type="checkbox"/>	Anti vibration								
Techometer:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Electrical	<input type="checkbox"/>	Mechanical		
Pressure indicator:	<input checked="" type="checkbox"/>	On Oil	<input type="checkbox"/>	On Cooling Water	<input type="checkbox"/>	After Filter	<input type="checkbox"/>	Before Filter		
Temperature indicator:	<input checked="" type="checkbox"/>	On Oil	<input checked="" type="checkbox"/>	On Cooling Water	<input checked="" type="checkbox"/>	After Filter	<input checked="" type="checkbox"/>	Before Filter		
Exhaust temperature measurement:	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Battery Charging Indicator:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Panel Mounted				
PRESSURE CHARGER										
Pressure Charger:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Turbo	<input type="checkbox"/>	Roots	Type	
Exhaust Silence:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Hospital Grade	<input type="checkbox"/>	Other		
Exhaust manifold:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Preoiling pump	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No						
BATTERY CHARGING										
Rectifier:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Input:	400 VAC ± 10%	Amps.	Cos Phi=0.8 Lagging		50 Hz. ± 2 Hz.					
Output:	24 VDC ± 1%	Amps.								
Voltage, Current Relays:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Batteries:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Ni-Cd.	<input type="checkbox"/>	Lead Acid (VRLA)	<input type="checkbox"/>	Other
Voltmeter (Both Input & Output):	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Ammeter (Both Input & Output):	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>					
Rectifier ON/OFF Switch:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
SAFETY DEVICES										
Low Oil Pressure:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input type="checkbox"/>	Shutdown		
High Engine Oil Temperature:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
High Water Temperature:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
Overspeed:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
Low Water Level	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
Over Cranking (Start failure):	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
Emergency Stop:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input checked="" type="checkbox"/>	Shutdown		
Intake Air shut off valve:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	Alarm	<input type="checkbox"/>	Shutdown		
Safety Guards:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No						
Low Fuel Level	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input type="checkbox"/>	Shutdown		
Knock-out Pot Level High:	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input type="checkbox"/>	Shutdown		
Manual Lockout at skid	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>					
Low Coolant Temperature	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Alarm	<input type="checkbox"/>	Shutdown		

Consultant		Data Sheet		
 ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR DIESEL ENGINE GENERATOR SET			
	Document No.	Revision	DATE	
Client	165-2-DSE-002	0	23-10-2018	
 OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET
	MF	NAK	MIAH	4 OF 7

DIESEL ENGINE

POWER TAKE-OFF

Friction Clutch:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Hydraulic Coupling:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Torque Converter:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Gear Box:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Coupling:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
V-Belt Pulley:	<input type="checkbox"/> Yes	<input type="checkbox"/> No

SPEED GOVERNING

Governor:	<input checked="" type="checkbox"/> Yes
	<input checked="" type="checkbox"/> Electronic <input type="checkbox"/> Hydraulic
Governor Speed:	<input type="checkbox"/> Variable <input type="checkbox"/> Fixed

ENGINE AIR REQUIRMENT

Combustion:	SCFM	Cooling
Combustion Air Quality		



FUEL SYSTEM



Type	Diesel	Heating Value	BTU/SCF
Pressure	bar	Consumption	SCFM or GPM



OIL SYSTEM

Capacity:	Liters	Type and Grade Lubrication Oil

Notes:
 1. The Supplier shall fill-in all the missing information in the Data Sheets, and submit with bid.

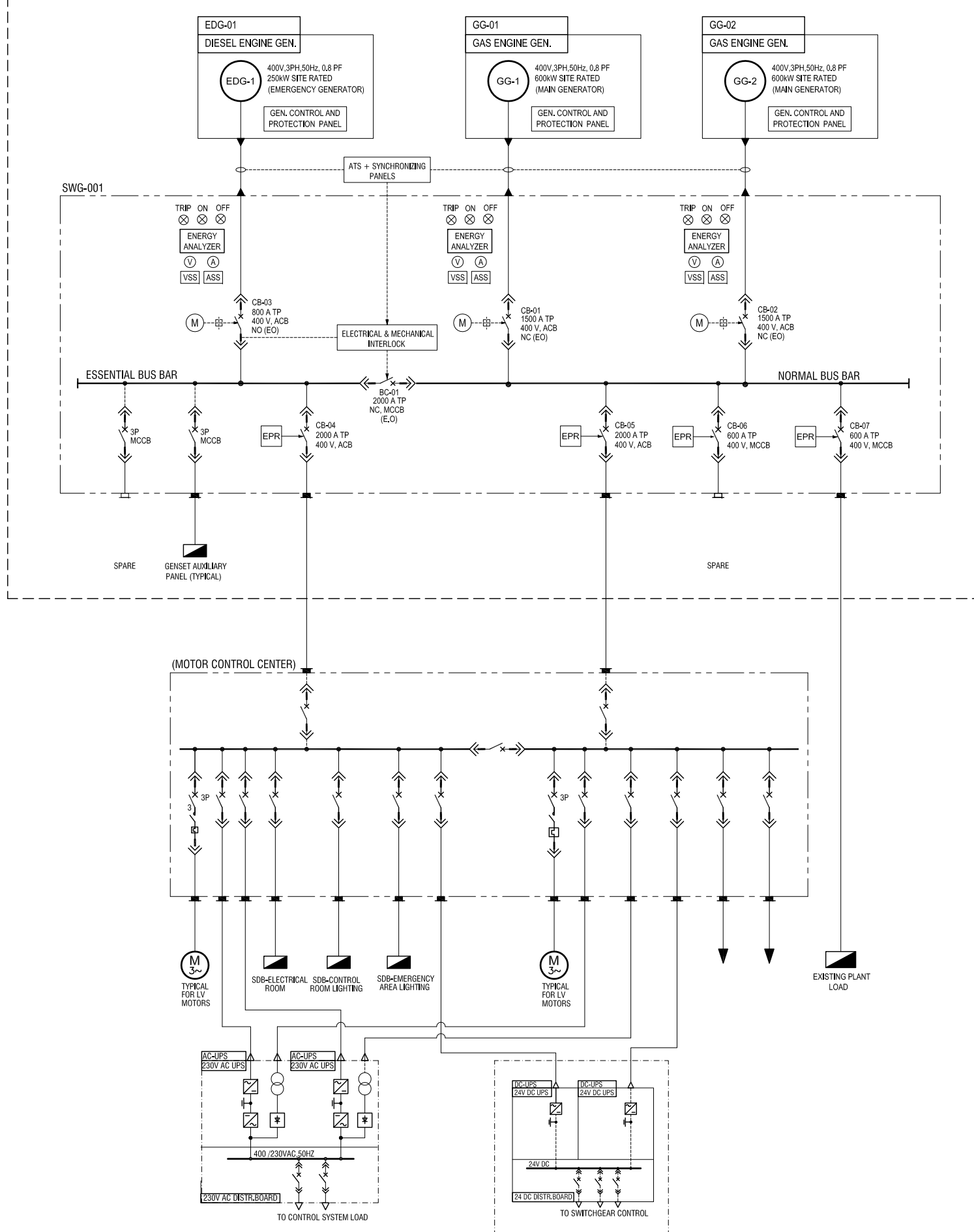
Consultant		Data Sheet			
	ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR DIESEL ENGINE GENERATOR SET			
		Document No.	Revision	DATE	
Client		165-2-DSE-002	0	23-10-2018	
	OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET
		MF	NAK	MAIAH	5 OF 7
SYNCHRONOUS ALTERNATORS					
SITE CONDITIONS					
Ambient Temp.(°F)	Minimum	30	Maximum	112	Humidity: 61%
					Altitude (ft): 1900 AMSL
Area Classification:	<input type="checkbox"/> Hazardous		<input checked="" type="checkbox"/> Non-hazardous		<input type="checkbox"/> Other
Atmosphere:	<input type="checkbox"/> Desert		<input type="checkbox"/> Marine		<input checked="" type="checkbox"/> Corrosive <input type="checkbox"/> Non-Corrosive
Siesmic Zone:	Zone-2B				
Wind Velocity:	<input checked="" type="checkbox"/> Maximum 100 mi/hr				
	<input type="checkbox"/> Others				
CHARACTERISTICS					
Utilisation:					Service: Prime
Useful Power (kW):	250				
Apparent Power (kVA):					Power Factor = 0.8
Synchronous Speed (rpm):	1500				
Voltage (V):	400				
Driving Machine:	DIESEL ENGINE				Number of Phase: 3 Phase + Neutral. Wire: 4
Coupling:					Neutral Grounding : SOLID
Direction of Rotation at the coupling end:					Shaft and Diameter:
Parallel Operation:	Yes				Shaft Height:
Excitation:	As per specification				Cooling Method: CACA
Automatic Voltage Regulation:	Yes				Heating Class:
Fire Protection:					Maximum Permissible Voltage Dip.: 15%
TYPE					
Protection:	IP 55 (In accordance with IEC 529)				
Gas Expanding Proofing:	(In accordance with IEC 79.1)				
Subdivision (A, B or C):	(In accordance with IEC 79.1)				
Temperature (T1 to T6):	(In accordance with IEC 79.1)				
Enhanced Safety:	(In accordance with IEC 79.7)				
Internal Overpressure:	(In accordance with IEC 79.2)				
STATOR					
Casing Orientation (H or V):	Horizontal				Bearing Type: Ball / Roller
Mounting:	SKID				Prestressed Rolling:
Insulation Class:	F				Smooth:
Winding Connection:	STAR		4 wire		Insulated:
Temperature Detectors:	YES		(PT-100 Type)		Anti-Condensation Heater: Yes @ 230 V AC
ROTOR					
Winding Material:	Copper				Cooling Method: CACA
Insulation Class:	F				
EXCITATION					
Separate Exciter:	Brushless Type		One end of Shaft:		Exciter Insulation Class: F
Solid State Excitation:			External:		Rotating Diodes:
SAFETY DEVICES					
Alternator Reverse Power:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input type="checkbox"/> Shutdown	
Alternator Earth Fault:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input type="checkbox"/> Shutdown	
Short Circuit	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input checked="" type="checkbox"/> Shutdown	
Over / Under Voltage	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input checked="" type="checkbox"/> Shutdown	
Overload	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input checked="" type="checkbox"/> Shutdown	
Alternator Winding Temp. High:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input type="checkbox"/> Shutdown	
Alternator Phase Unbalance:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input type="checkbox"/> Shutdown	
Alternator Overcurrent:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Alarm	<input type="checkbox"/> Shutdown	
Other:	See Specification				
TERMINAL BOXES					
Type:	IP 65				Position seen from Alternator end (Right, Left or Top):
Input:	Cable Glands (Brass)		Cable:		Flexible
Outside Diameter:	Dia. On armour:		Dia. Under armour:		

Consultant	Data Sheet			
 ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR DIESEL ENGINE GENERATOR SET			
	Document No.		Revision	DATE
Client	165-2-DSE-002		0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET
	MF	NAK	MIAH	6 OF 7
SYNCHRONOUS ALTERNATORS				
IDENTIFICATION PLATE				
Metal:	316L Stainless Steel			
TESTS				
Tests:	As per Specification			
MANUFACTURER'S DATA				
Name:				
Alternator Type/Model:				
Rated Power (kW):				
Rated Power (kVA):				
Cos Phi (Power Factor):				
Rated Current:				
Allowable Overload(%):				
Efficiency at Cos Phi = 1 at Full load:	3/4 Load:	1/2 Load:	1/4 Load:	
Efficiency at Cos Phi = 0.8 at Full load:	3/4 Load:	1/2 Load:	1/4 Load:	
Voltage Regulator Type:				
Bearings Make & Type:	Lubricant:			
REACTANCES				
Synchronous:	Longitudinal (Xd):		Tranverse (Xq):	
Transient:	Longitudinal (X'd):		Tranverse (X'q):	
Subtransient:	Longitudinal (X''d):		Tranverse (X''q):	
Negative Sequence Reactance (X₂):				
Zero Sequence Reactance (X₀):				
Resistance per rotor winding:				
TIME CONSTANTS				
Longitudinal transient off-load (T'd_o):				
Longitudinal Subtransient off-load (T''d_o):				
Tranverse off-load ((Tq_o):				
SHORT CIRCUIT CURRENTS				
Subtransient:	Transient:		Synchronous:	
Voltage:	Power:			
ENCLOSURE				
Structural Frame: <input checked="" type="checkbox"/> Hot Dip Galvanized Steel <input type="checkbox"/> Stainless Steel <input checked="" type="checkbox"/> Powder Paint Coated Sheet Steel				
WEIGHTS				
Stator:	Control Panels			
Rotor:				
Flywheel:				
Engine Generator Skid:				
MISCELLANEOUS				
Max. Allowable Unbalance Load:				
Degree of Protection Generator Enclosure:	IP54			
Degree of Protection Control Panel:	IP54			
Degree of Protection of Terminal Boxes:	IP65			
Rated Generator Circuit Breaker	Nominal:	Short Circuit :	KA rms	KA peak
Engine-Generator Skid Dimensions	Length	Width	Height	

Consultant	Data Sheet			
 ZISHAN ENGINEERS (PVT.) LTD.	DATA SHEET FOR DIESEL ENGINE GENERATOR SET			
	Document No.	Revision	DATE	
Client	165-2-DSE-002		0	23-10-2018
 OIL & GAS DEVELOPMENT COMPANY LTD.	Prepared By	Checked By	Approved By	SHEET
	MF	NAK	MIAH	7 OF 7
DOCUMENTATION / DRAWINGS				
List of Deviations from the Specification				
Statement of Compliance				
Dimensional Drawing of the Engine/Generator Combination				
Dimensional Drawing of Control Panel, Engine Panel, AMF Panel				
Schematic Diagrams				
Details on Protection Relays, with recommended settings				
All other documentation requirements are mentioned in 165-2-SPE-016 & 165-2-SPE-015.				
OBSERVATIONS				
Notes:				
1. Supplier shall fill-in all the missing information in the data sheets and submit with bid.				
2. This datasheet shall be read in conjunction with 165-2-SPE-015 & 165-2-SPE-016. All requirements mentioned in referred specifications shall remain applicable alongwith requirements of this datasheet				
3. Supplier shall fill-in all the missing information in the data sheets and submit with bid.				
4. Diesel Engine Genset shall operate as Emergency / black start up generator. This shall be synchronized with 2 nos. Gas Engine Generators. Diesel Genset shall require no external power source for auxiliaries at black start up.				
5. Genset shall be enclosed in Acoustic Canopy to limit noise level below 85 dBA at 1meter. The canopy shall be sized to have adequate free space for maintenance and shall meet requirement of IP-54.				
6. Genset shall have PLC based unit control panel.				
7. Vender to verify specified Alarm / shutdown scheme for the safety devices mentioned in this datasheet and relevant Specifications.				

DRAWING

WITHIN SCOPE OF CONTRACTOR OF POWER GENERATION SYSTEM & ALLIED EQUIPMENT PACKAGE



NOTES

1. NORMALLY POWER SUPPLY TO FACILITIES SHALL BE MADE THROUGH 1 No. GAS ENGINE DRIVEN GENERATORS WHILE 1 No. GENERATOR SHALL REMAIN STAND-BY.
2. DIESEL ENGINE DRIVEN SHALL BE RUN TO SUPPLY POWER TO THE ESSENTIAL LOAD OF FACILITIES AND SHALL ALSO BE USED FOR THE BLACK START OF PLANT.
3. THE EMERGENCY DIESEL GENERATOR SHALL BE SYNCHRONIZED WITH THE GAS GENERATOR IN AUTO/MANUAL MODE FOR PARALLEL OPERATION.
4. BUS COUPLER (BC-01) SHALL PROVIDE MAKE BEFORE BREAK OPERATIONAL INTERLOCKING WITH DG SET INCOMER CB DURING BLACK START OF PLANT. IT SHALL BE OPENED FOR SECTIONAL MAINTENANCE OF SWG-001 AS AND WHEN REQUIRED.
5. GENERATOR AUXILIARY CONTROL PANEL WILL BE PROVIDED BY VENDORS.
6. GENERATOR AUXILIARY CONTROL PANEL SHOULD HAVE 20% SPARE STARTERS ALONG WITH 10% SPACE.
7. ALL THE POWER, INSTRUMENT & CONTROL CABLING BETWEEN GENERATOR, UCP SYNC PANEL, ATS / AMF PANEL AND GENERATOR AUXILIARY PANEL WILL BE PROVIDED BY VENDOR.
8. THE VENDOR WILL PROVIDE THE TERMINATION DRAWING FOR INSTRUMENT AND CONTROL CABLE INSTALLATION.
9. VENDOR WILL PROVIDE GENERATORS CONTROL PANEL AND OTHER CONTROL PANEL REQUIRED FOR SYNCHRONIZING LOAD SHARING & AUTO STARTING.
10. BUSBAR SHALL BE OF 2000A, 3P+N+E, 50Hz, 35kA RMS 3 SEC, TIN COATED Cu BUS BAR TYPE.
11. THE NUMBER AND RATINGS OF THE OUTGOING CIRCUITS OF GENERATOR AUXILIARY PANEL, FEEDING GENSET(S) AUXILIARY PANEL(S) SHALL BE FINALIZED BY PACKAGE VENDOR AND SHALL BE INCLUDED IN ITS SCOPE OF SUPPLY AS PART OF SWG-001.

CIRCUIT BREAKER / BUS COUPLER OPERATING SCHEME

POSITION OF CB	CB-01 CB-02	BC-01	CB-04 CB-05	CB-03
BLACK START	OPEN	OPEN	OPEN	CLOSE
NORMAL OPERATION	CLOSE	CLOSE	CLOSE	OPEN

LEGENDS:

- 3 PHASE AC MOTOR
- ELECTRONIC PROTECTION RELAY
- VOLTMETER
- INDICATION LIGHT
- AMMETER
- DISTRIBUTION BOARD
- VOLTMETER SELECTOR SWITCH
- AMMETER SELECTOR SWITCH
- ENERGY ANALYZER
- GENERATOR
- NON-WITHDRAWABLE BREAKER
- MOTORIZED CIRCUIT BREAKER
- WITHDRAWABLE BREAKER

ISSUED FOR TENDER

REV.	DATE	DESCRIPTION OF REVISION	DRAWN	CHECKED	APPR.	
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0	04-12-2013	ISSUED FOR TENDER		AHS	MK	NAK

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PROJECT: **MELA DEVELOPMENT PROJECT**

TITLE: **KEY SINGLE LINE DIAGRAM**

DWG. NO. **165-2-ELS-001**

REV. **3**

JOB NO. **165-2**

SIZE	SCALE	SHEET
A3	N.T.S	1 OF 1

SPECIFICATIONS

ELECTRICAL SPECIFICATIONS



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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

GENERAL SPECIFICATIONS FOR MOTORS



Rev.	Date	Description	Prepared By	Checked By	Approved By
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1.0 **SCOPE**

This specification covers the general requirements for design, manufacturing, supply, installation and testing of the motors to be used for Oil & Gas Development Company (OGDCL's) Gas Processing Plant Project.

2.0 **CODES AND STANDARDS**

2.1 Design, manufacturing, test and inspection, material selection shall conform to the following IEC, BS and other standards :

IEC 60034	Rotating electrical machines
IEC 60072	Dimension and output rating
IEC 60079	Electrical apparatus for explosive gas atmospheres
IEC 60085	Classification of materials for the insulation
BS 2757	Method for determining the thermal classification of electric insulation
BS 4278	Specification for eye bolts for lifting purpose
BS 4683	Part 2 : The construction and Testing of flameproof enclosures of electrical apparatus
BS 4999	General requirements for rotating electrical machines Part 0, Part 101, Part 105, Part 108, Part 111, Part 112, Part 141, Part 142, Part 143 and Part 145
BS 5000	Rotating machines of particular types or for particular application
S 5354	Selection, installation and Maintenance of Electrical Apparatus for Use in Potentially Explosive Atmospheres
BS 5501	Electrical apparatus for potentially explosive atmosphere Part 1 and Part 5
BS 6121	Mechanical cable glands for elastomer and plastic insulated cables
ISO R281	Roller bearings : Dynamic load rating and rated life
*NEMA MG1	Motors and Generators

*Note: Other standards shall only be considered for those cases not covered by IEC standards.

2.2 It shall be the manufacturer's responsibility to be, or to become, knowledgeable of the requirements of these standards and codes. Any changes or alternations to the equipment to make it meet standards and codes requirements shall be at the expense of the manufacturer.

2.3 **Order of Precedence for Documents**

- Country laws and regulation
- Project specifications and drawings
- IEC and internationally recognized standards

3.0 **SERVICE CONDITIONS**

Service conditions for the equipment covered by this specification shall be in accordance with Specification 'Site, Environment & Utility Data.

4.0 **DESIGN AND CONSTRUCTION**

4.1 **Design**

4.1.1 Motors shall be of three phase squirrel caged motor, and shall comply with the requirements of above standards unless otherwise specified. Motors shall be designed for duty type S1 and be suitable for direct on line starting, unless otherwise specified.

4.1.2 Motors shall have IEC frame size in accordance with IEC 60072-1 and 60072-2.

4.1.3 Motors shall be designed for a minimum of 25,000 hours continuous operation without requiring maintenance.

4.1.4 The minimum design life time of motors shall be 25 years.

4.1.5 Vendor shall only quote motors which have already been successfully type tested in accordance with the relevant IEC standards. Type test reports shall be made available, on Purchaser's request with the bid.

- 4.1.6 Motors shall be suitable for continuous operation at full load rating under a combined variation of the following voltage and frequency as per Para. 1.2.3 of IEC 60034-1:
- Voltage fluctuation : $\pm 10\%$ of rated voltage
 - Frequency fluctuation : $\pm 2\%$ of rated frequency
- 4.1.7 The moisture proofing, anti-corrosion protection and/or anti-tropical protection shall be applied for the motor winding.
- 4.1.8 The torque - speed characteristics shall be adequate for starting the driven load under the most arduous conditions specified, e.g. open pump discharge valve, at 80% rated voltage. The accelerating torque at any speed and 80% rated voltage shall be not less than 10% of the rated full load torque.
- 4.1.9 The specified motor shall be designed to apply re-acceleration operation for about 0.5sec voltage dip and re-starting operation about 1sec power failure.
- 4.1.10 The starting current at full voltage shall not exceed 700% of rated current for LV motors..
- 4.1.11 Motors shall be capable of starting three (3) consecutive times starting from rated ambient temperature and two (2) consecutive times from rated operating temperature. Motors rated above 375 kW (500 hp) that have been started under the above mentioned conditions shall not be restarted for a minimum of one hour.
- 4.1.12 The motors shall be designed to operate for a periods of not less than 5 minutes at a voltage of 25% below the rated voltage at rated frequency without injuries overheating.
- 4.1.13 Vibration severity requirements shall comply with IEC 60034-14 grade N.

4.1.14 The motor rated voltage, power range, phase and frequency shall be as follows :

Motor Power	Name Plate	Phase	Frequency	Remarks
Range	Voltage		[Hz]	
185 kW and below	400 V	3 *	50	

Note: Motors up to 0.75 kW will be single phase 230 V, 50 Hz for industrial use, 3 phase motor will apply for hazardous areas.

4.2 **Construction**

4.2.1 Type of ventilation and cooling

The motors shall generally be of self ventilated, air cooled type. The direction of airflow shall be such that air is not drawn from the direction of the driven equipment.

4.2.2 Type of enclosure

4.2.2.1 Enclosure of motors shall generally be of the totally enclosed fan-cooled type (TEFC), but totally enclosed natural-ventilated type (TENV) is acceptable for fractional capacity motors. Totally enclosed CACA design is also acceptable for large capacity motors, if TEFC type is not practicable. The degree of protection shall be of IP55 or above for outdoor and IP31 for indoor installation.

Full details of cooling system shall be submitted at the bid stage for approval.

4.2.2.2 The motors for use in explosive gas atmospheres shall be of the following types of construction depending on the classifications of the hazardous locations in which they are to be installed:

- (a) Motors and their terminal boxes for use in Zone 1 hazardous locations: Flameproof enclosure “d”, pressurized enclosure “p” or increased safety “e.” Type “e” motors which are rated 6.6kV should not be selected.

- (b) Motors and their terminal boxes for use in Zone 2 hazardous locations : Motor for Zone 1 or type “n”, unless otherwise specified in the data sheets.
- (c) Electric motors of type “n” or type “e” which are rated 6.6 kV which are situated in Zone 2 hazardous area should not be started if there is a possibility of a potentially explosive atmosphere within the motor enclosure.
- (d) Accessories or parts of the motor with make and break contacts (e.g. temperature switch, pressure switch) or sliding contacts, and which are used in Zone 1 or Zone 2 hazardous location, shall be of flameproof enclosure, pressurized enclosure or intrinsic safety system.
- (e) Where motors are used in Zone 1 or Zone 2 hazardous locations, non-sparking materials shall be used for the cooling fan of the motors.
- (f) For motors to be installed in hazardous areas, the motors and all auxiliary electrical equipment mounted on the motor shall be certified for use in hazardous area.
- (g) The following points shall be complied with for all type Exe and Exn motors which are intended for use in Zone 2 hazardous areas:
 - i) The motor manufacturer shall be contacted for advice as to any special recommendations or precautions that shall be adopted or followed with respect to the starting and normal running of the motor under the expected plant environment and conditions. Any such recommendations shall be fully complied with, and any special operational requirements shall be made known to client.
 - ii) The motors shall incorporate measures to eliminate the possibility of gas ingress to the motor enclosure from common systems, e.g. separation of compressor seal oil and motor lube oil systems on gas compressor drives.
 - iii) The motors shall be fitted with suitably sized air inlet and outlet nozzles for the connection of a purge gas supply.

- iv) Equipotential bonding straps shall be provided between screwed bosses on the component parts of the enclosures. These straps shall be fitted symmetrically to the motor axis, be as short as possible and adequately sized for current carrying capacity and physical strength.
- (h) The motors to be installed in non-hazardous area shall be of the weather protected type.
- (i) Enclosures for the motors shall be designed to prevent the entrance of liquids or solids through any openings such as air intakes, air outlets, enclosure joints or shaft extensions, and the entrance of moisture and dust through the ventilating system to the enclosure shall be minimized. Openings shall be suitably screened to prevent the entrance of harmful materials.
- (j) When motors are vertically mounted with the driving end shaft up, they shall be of "IMV6" (Foot Mount/Vertical/Shaft-up) type and provided with a slinger plate on the driving end shaft to prevent water from entering the motor housing along the shaft. The construction of the foot mount motors shall prevent the build up of water around the upper shaft bearing. The motors shall have threaded drain plugs in the lower end to allow removal of moisture. The plug shall be easily removable at the construction site.
- (k) Vertical mounting (fan up) motors for outdoor use shall have a drip shield over the fan.
- (l) Frames shall be constructed from cast iron or fabricated steel.

4.2.3 Rotors

- a) Rotors and external fans shall be dynamically balanced. Balance weights, if fitted, shall not be of lead or similar ductile material, and the rotor design shall allow for the addition of balancing weights.

- b) The bars of cage rotors shall be brazed or welded to the short-circuiting rings, unless the bars and rings of the cage are manufactured as a solid unit.
- c) Each motor shall generally be provided with a coupling key on the motor shaft.

4.2.4 Insulation Class

- a) 400V and below:

Class F (the allowable temperature rise shall not exceed that of Class B, based on design temperature of 40 °C)

* Note: Temperature rise may exceed the limits of Class B insulation at 47.5 °C ambient temperature, but shall not exceed Class F limits.

4.2.5 Noise Level

Noise level of motors shall comply with the specific noise control requirements and not exceed 85dBA at 1m.

Noise levels shall meet as a minimum of the requirements of IEC 60034-9.

4.2.6 Bearing and Lubrication

- a) Grease or oil lubricated bearings shall be used for random wound motors.
- b) Bearing housings for grease lubricated bearings shall be provided with exterior fill and relief plugs in tapped holes. Relief plugs must be large enough to relieve bearings without grease getting into motor.
- c) Sealed pre-lubricated ball bearings are acceptable only for small motors (Frame size 180 or less).
- d) Ball and roller bearing housings shall be such that re-lubrication, if required, can be carried out without stopping the motor. The minimum lubrication intervals shall be 4,000 hours for horizontal motors and 2,000 hours for vertical motors.

- e) To prevent damage to bearings by shaft circulating currents, the non driven end bearing shall be electrically insulated from the motor frame, if the induced voltage measured between shaft ends exceeds either 250 mV rms for ball and roller bearings, or 400 mV rms for sleeve bearings.

4.2.7 Terminal Boxes

- a) All terminal boxes shall be made of cast iron, cast steel, or 1/8 inch minimum thickness steel plate. Boxes shall be furnished with a threaded cable gland entry, watertight, and fully gasketed.
- b) The motor terminal box shall have IP55 or above weather protection.
- c) Terminal box on the horizontal motors shall be on the right side when facing the drive-end or on the top of motor enclosure.

The terminal box shall be rotatable every 90 degree on any direction.

- d) Motor terminals shall be clearly and permanently marked with reference letters in accordance with applicable standards.
- e) The terminal box and cable gland arrangement shall permit disconnection of the cable from the motor without disturbing the actual cable termination and seal.
- f) The main cable terminal box and auxiliary terminal boxes shall be separated.
- g) The cable glands at motor terminal shall meet the requirements of area classification, preferably flameproof.

4.2.8 Operation

Motors shall be designed for re-acceleration, re-starting operation, if specified. The plant motors will be designed with group re-starting after power recovery.

Manufacturer shall state their recommended residual voltage limit for re-starting, if any. The re-acceleration will be applied by time delay contactor against within 0.5sec voltage dip.

5.0 **ACCESSORIES**

5.1 **Space Heater**

- a) Space heater shall be provided for LV motors having size equal to or greater than 70kW. The space heater shall be energized while motors are stopped.
- b) The space heaters leads shall be brought out into a separate terminal box from the motor main terminal box.
- c) The rated voltage of the space heaters shall be 230 V, single phase, 50Hz.

5.2 **Earthing Terminals**

Each motor shall be provided with an external earthing terminal on the motor frame and an internal earthing terminal in the motor main terminal box. These earthing terminals shall be clearly and permanently marked with the letter "E".

5.3 **Resistance Temperature Detector**

Motors 1000 kW and larger shall include resistance temperature detectors (RTD) embedded in the stator. One RTD per phase shall be fitted. A separate terminal box on the motor enclosure shall be provided for connecting the RTDs to monitors.

The RTD's shall be designed and installed in accordance with IEC or equivalent standards.

6.0 **NAMEPLATES**

The nameplate shall be provided in accordance with IEC / BS, and additional non-corrosive metal plates shall be supplied to indicate the following:

- Motor Item Number
- Direction of Rotation
- Instruction for lubrication, with bearing numbers

7.0 **FINISH**

- 7.1 The exterior shall be thoroughly cleaned, scraped and wire brushed to remove all rust, grease and dirt. immediately after preparation the exterior shall be primed with one coat of red oxide primer followed by two coats of best quality anti-corrosive finishing paint.
- 7.2 The color of the finish shall comply with the specific job requirement.

8.0 **TEST AND INSPECTION**

- 8.1 The motors shall be factory tested in fully assembled condition in accordance with the released IEC standards and manufacturer's QA/QC program.
- 8.2 Witness inspection, when so specified, shall be carried out in accordance with the requirements of "Scope of Inspection" in the requisition.

9.0 **MANUFACTURER'S MOTOR DATA**

- 9.1 Manufacturer shall complete and submit attached motor data sheet.
- 9.2 Manufacturer shall recommend power factor capacity for improving the power factor to 0.98 lagging.
- 9.3 Manufacturer's drawing and data shall include not limited the following where applicable;
- Complete dimensional outline drawing and general assembly drawing
 - Terminal box assembly drawing
 - Recommended spare parts
 - Installation, operating and maintenance instructions
 - Connection diagram with terminal marking

APPENDIX –I

DATA SHEET FOR LV & MV MOTOR (TYPICAL)

DATA SHEET FOR LV & MV MOTOR (TYPICAL)

REQUIREMENTS AND CONDITIONS				MOTOR MANUFACTURER'S DATA			
SERVICE	: OUTDOOR/INDOOR	NOISE	: LESS THAN dB (A) at full load				
ATMOSPHERE	: CORROSIVE/ NON-CORROSIVE	FINISH COLOR	: (MUNSELL) T.B. THREAD SIZE (mm)	MANUFACTURER :			
AREA CLASSIFICATION	: CL. ZONE GROUP NON-HAZARDOUS	SPACE HEATER	: REQUIRED / NOT REQUIR *	MANUFACTURER ORDER NO. :			
AMBIENT TEMPERATURE (7)	: MAX. 112 °F, MIN. 30 °F	WINDING TEMP. DETECTORS	: REQUIRED / NOT REQUIRED *	SERIAL NO. :			
RATED VOLTAGE	: 400 V 50 Hz			MOTOR DRWG. NO. :			
TYPE OF ENCLOSURE (1)	: TE	SUN SHADE	: REQUIRED / NOT REQUIRED	STANDARD	: CONSTRUCTION FOR HAZ. AREAS :	IEC	PERFORMANCES : IEC DIMENSIONS : IEC
SYSTEM OF COOLING (2)	: FC/(CACA only when FC not possible)	DRIVEN MACHINE DATA		TYPE AND/OR FRAME SIZE :			
FEATURE OF PROTECTION (3)	: IP 55	MACHINE	: PUMP/COMPRESSOR/BLOWER/FAN/MIXER/CONVE.	STATOR WINDING CONNECTION :			
TEMPERATURE CLASS -	: T3			INSULATION CLASS & TEMP. RISE : INS. CLASS TEMP. ° C			
TIME RATING	:	TYPE	: CENTR./RECIP./ROTARY/SCREW	RATED OUTPUT (5) / CURRENT : kW A			
DRIVING CONDITION	: CONTINUOUS/ INTERMITTENT/ INCHING	MANUFACTURER	:	RATED SPEED : rpm			
RATED OUTPUT	: kW	COUNTER TORQUE	: kg -m	POWER FACTOR : FULL LOAD % 3/4 LOAD % 1/2 LOAD %			
SERVICE FACTOR	: 1.0	B.H.P.	: kW	EFFICIENCY : FULL LOAD % 3/4 LOAD % 1/2 LOAD %			
NO. POLES / SYNCH. SPEED	: P / rpm	INERTIA (BD ²)	: kg-m ²	LOCKED ROTOR CURRENT :			
TYPE OF MOUNTING	: HORIZONTAL/ VERTICAL	REQ'D. END PLAY	: DE mm, NDE mm	RATED TORQUE : kg-m			
	: FOOT/ FLANGE	THRUST	: UP kg, DOWN kg	LOCKED ROTOR CURRENT : %			
		COUPLING METHOD	: DIRECT / BELT / GEAR	PULL OUT TORQUE : %			
ROTATION (viewed from anti-coupling side :	CW/ CCW/ REVERSIBLE	HALF COUPLING	: SUPPLIED BY MANUFACTURER	STARTING TIME : SEC. AT 80% VOLT / SEC. AT 100% VOLT			
STARTING METHOD (4)	: FV /		: AT MOTOR SIDE FITTED BY MANUFACTURER	MOTOR ROTOR INERTIA (GD ²) : kg-m ²			
				LOCKED ROTOR WITHSTANDING TIME :			
TERMINAL BOX THREAD SIZE (ISO) *	: PF			COOLING TIME CONSTANT (6) :			
				HEATING TIME CONSTANT (6) :			
CABLE TYPE SIZE *	: mm ²	REMARKS		HOT/COLD RATIO : %			
VOLTAGE DIP PROTECTION (RE-ACCEL :		Vendor shall complete the data sheet.		BEARING NO. : DE NDE			
RE-STARTING :				LUBRICATION SYSTEM : GREASE/OIL/SELF LUB./FORCED LUB.			
				END PLAY : DE mm, NDE mm			
				WEIGHT : ROTOR kg, TOTAL kg			
				POWER CAPACITOR : kVAR			
The requirements other than those specified herein shall be shown on Project Specification No.				SPACE HEATER : 230 V, 1 ph, 50 Hz W			
NOTES:							
1.	TE	: Totally Enclosed					
2.	FC	: Fan Cooled, OACA :	Air to Air Cooled				
3.	Type "d"	: Flameproof, Type "e" :	Increased Safety,				
	Type "p"	: Pressurized, Type "n" :	Non-Sparking Type				
	WP	: Weather Protection, GP :	General Purpose				
4.	FV	: Full Voltage, SD :	Star-Delta REAC :	Reactor COM :	Compensator		
5.	Rated output values shall comply with the values listed in IEC Publication 60072 para. 9.						
6.	Applicable for 6.6 kV motors.						
7.	Design Temperature : -						
	Insulation Class : F						



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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

TECHNICAL SPECIFICATION FOR GAS ENGINE GENERATORS



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1.0 **SCOPE**

This specification covers the minimum basic requirements for the engineering, design, manufacturing, inspection, supply, testing & commissioning of gas engine generators as specified herein and in the data sheets respectively.

1.1 **Definitions**

Following definitions apply throughout this document:

COMPANY: Oil & Gas Development Company Ltd. (OGDCL)

VENDOR / SUPPLIER: The organization, firm or agency with whom order for the supply of equipment and or material has been placed.

1.2 **Errors or Omissions**

1.2.1 The review and comment by the COMPANY of any VENDOR's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the VENDOR of its obligations to comply with the requirements of this specification and other related parts of the Contract Documents.

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

1.3 **Deviations**

All deviations to this specification, other specifications or attachments shall be brought to the knowledge of the COMPANY as a section in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the COMPANY prior to execution of the work. Such deviations shall be shown in the documentation prepared by the VENDOR.

1.4 **Conflicting Requirements**

In the event of any conflict, inconsistency or ambiguity between the VENDOR's scope of work, this Specification, National Codes & Standards, referenced in the Project Specification or any other documents, the VENDOR shall refer to the COMPANY whose decision shall prevail.

1.5 **General**

- 1.5.1 This specification covers the requirements for gas engine driven synchronous generators, generator control panels, and generator auxiliary systems, etc.
- 1.5.2 The engine-generator shall be rated for continuous duty service at rated kilowatts, kilovolt-amperes, voltage, and site conditions.
- 1.5.3 The unit shall be capable of operating at 100 percent of rated load 24 hour hours of continuous operation.
- 1.5.4 The engine-generator, all auxiliaries, and installation as a package shall be suitable for the site conditions as indicated on the technical data sheets.
- 1.5.5 All equipment and components shall be new, of current manufacture, and with proven service record for the intended application.
- 1.5.6 The engine-generator VENDOR / SUPPLIER shall assume full responsibility for the performance of necessary torsional studies and the elimination of any lateral or torsional vibrations that may hinder the operation of the complete package at operational speed.
- 1.5.7 Constant speed applications for engine-generators shall be considered to have a speed range of ± 10 percent of rated speed.
- 1.5.8 The engine shall have a bare engine brake horsepower rating of at least 25 percent greater than the power required to drive all connected equipment at rated load and speed at site conditions. The engine rating shall be substantiated by the manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.
- 1.5.9 Arrangement of equipment, auxiliaries, and piping shall provide adequate clearance areas and safe access for operation and maintenance.

- 1.5.10 The requirements of this specification are specific for engine-generator applications. Company shall be advised of any conflicts and shall interpret intent as necessary.
- 1.5.11 The engine and generator package shall be skid mounted on vibration isolators, complete with acoustic canopy.
- 1.5.12 Engine-generator shall be self-sufficient and shall not require external supplies of electric power.
- 1.5.13 Generator units shall be capable of starting, accelerating to operating speed, and carrying full load within twenty seconds after actuation of the start signal.
- 1.5.14 A minimum clearance of 914 mm (36 in) shall be supplied around engine-generators for maintenance purposes.
- 1.5.15 The engine-generator, when shut down normally, shall have a preset unload and cool down cycle before shutdown.

1.6 **Performance Data**

- 1.6.1 The following performance data and curves shall be provided:
 - a) Generator data sheet, listing reactance and time constant values.
 - b) Saturation and Synchronous Impedance Curves.
 - c) Reactive capability curves for the minimum and maximum cooling air temperature.
 - d) Air gap torque vs. rotor angle curve.
 - e) Short circuit current vs. rotor angle on voltage recovery curve.
 - f) Governor response to load change.
 - g) Voltage regulator response to load change.

- 1.6.2 Performance data and curves are required at the bid stage along with the original proposal and any subsequent Purchase Order. All curves submitted prior to final performance testing shall be marked “PREDICTED”. Any set of curves resulting from a test shall be marked as “TESTED”. All performance data and curves shall be included in the Equipment Data Book.

2.0 **REFERENCES**

2.1 **General**

- 2.1.1 The following industry publications and other project specifications are referenced herein and shall be considered part of this specification. Refer to the latest edition unless specified otherwise. It shall be the VENDOR / SUPPLIER responsibility to be knowledgeable of the requirements of these standards and codes.
- 2.1.2 In the event of any conflict between this specification and the requirements of other specifications or industry standards and codes, the more stringent requirements shall apply with the written approval of Company.

Reference shall also be made to main package specifications and Scope of work for further insight into requirements.

All deviations from the requirements of this specification, its attachments, and the referenced codes and standards shall be stated by the VENDOR / SUPPLIER in his quotation. In the absence of such a statement, full compliance will be assumed.

- 2.1.3 Compliance by the VENDOR / SUPPLIER with the provision of this specification does not relieve him of his responsibility to furnish equipment and accessories of a proper mechanical design suitable for the specified service conditions.

In the absence of any applicable codes and standards, the VENDOR / SUPPLIER will adhere to the best engineering practices and the material and workmanship shall be of a high standard.

2.1.4 The Gas Engine Generator covered by this specification shall be designed, manufactured, inspected, tested, painted and prepared for shipment in accordance with the requirements of the following codes and standards listed therein:

▪ **ABMA - American Bearing Manufacturers Association**

ABMA 9 Load Rating and Fatigue Life for Ball Bearings

ABMA 11 Load Ratings and Fatigue Life for Roller Bearings

▪ **ANSI - American National Standards Institute**

ANSI C57.13 Standard Requirements for Instrument Transformers

ANSI C50.10 Rotating Electrical Machinery – Synchronous Machines

ANSI C50.13 Rotating Electrical Machinery – Cylindrical Rotor Synchronous Generators

▪ **API - American Petroleum Institute**

API 670 Vibration, Axial-Position and Bearing Temperature Monitoring Systems

API 671 Special Purpose Couplings for Petroleum Chemical and Gas Industry Services

API 614 General Purpose Lube Oil System Components for Rating Process Equipment

▪ **IEEE - The Institute of Electrical and Electronic Engineers**

IEEE STD 43 Recommended Practice for Testing Insulation Resistance of Rotating Machinery

IEEE STD 85 Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery

IEEE STD 115 Test Procedures for Synchronous Machines

IEEE STD 421.5 IEEE Recommended Practice for Excitation System Models for Power System Stability Studies

▪ **NEMA - National Electrical Manufacturers Association**

NEMA MG 1 Motors and Generators

▪ **NFPA - National Fire Protection Association**

NFPA 70 Fire Fighting

▪ **BS – British Standards**

4999 General Requirements for Rotating Electrical Machines

7671 Requirements for Electrical Installations

▪ **IEC – International Electrotechnical Commission**

60034 Rotating Electrical Machines

60072 Dimensions and Output Ratings for Rotating Electrical Machines

60079 Electrical Apparatus for Explosive Atmospheres

60085 Thermal Evaluation and Classification of Electrical Insulation

60185 Current Transformers

60529 Classification of Degree of Protection Provided By Enclosures

60909 Short-Circuit Calculation in Three –Phase A.C. Systems

3.0 **DESIGN REQUIREMENTS**

3.1 **General**

The gas engine driven generator sets shall be skid mounted and shall include the following items as a minimum:

- Natural gas fueled engine.
- Generator
- Engine Starter (electric)
- Fuel System
- Lube Oil Cooler
- Jacket Water Cooler (Radiator)
- Air Inlet Filters
- Exhaust Silencer with Spark Arrestor
- Expansion Joints, Elbow
- Electronic Governor
- Fuel Shutoff Valve
- Generator Main Power Terminal Box
- Generator AC Controls Terminal Box
- Generator DC Instrumentation Terminal Box
- Electrical/Instrument Devices
- Rigid Steel Skid
- Vibration Isolators
- Engine Gauge Panel
- Generator Control Panel
- Lube Oil Filter
- Voltage Regulator
- Cranking Controls
- Acoustic canopy

All equipment shall be designed for installation and operation in a fairly level, dusty, tropical environment and ventilated with unconditioned outside air, unless specified otherwise.

4.0 **ENGINE DESIGN**

4.1 **General**

- 4.1.1 The engine driver shall be a reciprocating internal combustion Natural Gas engine complying BS 551/ISO 3046 or equal. The engine shall have a continuous rating, derated for site conditions at the maximum air ambient, minimum fuel gas pressure and all power transmission losses, at least equal to 110 percent of the bhp required for continuous operation supplying the maximum generator demand specified.
- 4.1.2 The engine-driven train shall not have any torsional natural frequencies within 10 percent of the first or second harmonic of the rotational frequency of any shaft in the operating speed range.
- 4.1.3 Constant speed applications shall be considered to have an operating speed range of ± 10 percent of rated speed.
- 4.1.4 Materials of construction shall be as required by ASME Boiler and Pressure Vessel Code standards. Supplier standard will be considered as alternatives.
- 4.1.5 The engine shall include replaceable cylinder liners of the wet sleeve type and replaceable valve seat inserts. Combustion chambers shall be of the open type. Connecting rods and crankshaft shall be of forged steel.
- 4.1.6 Engine drive for attached auxiliaries shall be gear, V-belt, or chain type. V-belt and chain drives shall be furnished with adjustable tensioning devices.
- 4.1.7 Bearings shall be manufacturer's standard. Shims shall not be used for any bearing.
- 4.1.8 The engine shall be designed to minimize the requirement of special tools for installation and maintenance. One set of such tools with a description and instructions for their use shall be supplied.

4.2 **Intake Air System**

4.2.1 The engine shall be provided with one or more engine-mounted dry-type air cleaners of sufficient capacity to protect the working parts of the engine from dust, grit and moisture laden air.

4.3 **Starting System**

4.3.1 The VENDOR / SUPPLIER shall furnish a complete starting system for each engine-generator.

4.3.2 The start system shall be dual electric 24 VDC. All equipment shall be listed for applicable hazardous area classification. Dual starting batteries shall be provided by package Supplier. Batteries shall be Nickel Cadmium or Lead Acid (VRLA) and shall be supplied in a lockable vented powder paint coated sheet steel battery box. Starting battery chargers shall be supplied off skid.

4.3.3 The engine shall be cranked in a series of crank-rest cycles, automatically alternating between batteries on each cycle.

4.3.4 Starting devices operating on the flywheel shall have enclosed rotating parts.

4.3.5 The VENDOR / SUPPLIER shall advise Company during bid phase of any special engine preparation required for automatic starting for the specified ambient conditions.

4.3.6 Each engine starting battery shall be sized for six (6) 15-second cranks at 48°C ambient temperature. Battery sizing shall include a 1.25 design margin.

4.3.7 Battery charger for charging of engine cranking batteries shall be interlocked with engine crank signal so that charger will automatically cutoff on engine crank signal from generator control panel and re-connect automatically upon reaching of engine RPM at pre-defined level.

4.4 **Fuel Systems**

4.4.1 The following components shall be provided in the fuel system as a minimum:

- Carburetion System
- Vertical Separator (same shall be sized on the basis of Raw gas)
- Interconnection piping and fittings to engine
- Solenoid actuated fuel shutoff valve
- Solenoid actuator fuel line vent valve
- Fuel gas pressure regulator
- Pressure Safety Valve

4.4.2 **Natural Gas Fuel System Requirements**

4.4.2.1 Supplier shall provide a complete on-skid fuel system. All necessary valves and regulators shall be consistent with the pressure. Fisher gas regulators or equivalent with steel bodies shall be provided for pressure reduction. An explosion-proof, all steel, solenoid type fuel valve shall be furnished and installed in the fuel gas supply line on the engine. This valve shall be automatically latched to start the engine and electrically tripped. The engine shutdown devices shall be configured to electrically trip the engine by at least closing the fuel valve. An Altronic (or equivalent) system shall be included in the engine system.

4.4.3 **Supplier Responsibility**

- Company will provide 230 VAC, 50 Hz power supply feeder(s) for generator UCPs from its UPS source. Package Vendor, however shall indicate power requirements for the same in its bid. Furthermore source for any other voltage level (such as 24VDC etc) shall be furnished by Package Vendor.
- Fuel gas piping will be provided by the Company upto the Vendor / Supplier designated tie-in point. Fuel Gas will be provided from raw gas) of composition range as mentioned below.

- Fuel gas supply pressure will be 70 psig. Any further pressure regulation, if required by generator shall be furnished by Supplier / Vendor as part of its scope. Pressure requirement shall be communicated by the VENDOR / SUPPLIER in its bid.

Following is the gas composition data for the source.

COMPONENTS	FUEL GAS ANALYSIS		
	Case-I	Case-II	Case-III
Hydrogen	0.00	0.00	0.00
H2S	0.00	0.00	0.00
CO2	1.25	1.27	1.25
Nitrogen	1.03	1.00	0.95
Methane	81.13	80.08	77.02
Ethane	8.72	9.05	9.16
Propane	4.37	4.77	5.37
i-Butane	0.71	0.79	1.03
n-Butane	1.31	1.45	2.01
22-Mpropane	0.00	0.01	0.01
i-Pentane	0.39	0.42	0.69
n-Pentane	0.33	0.35	0.60
n-Hexane	0.21	0.20	0.40
Mcyclopentan	0.06	0.06	0.12
Benzene	0.06	0.06	0.12
Cyclohexane	0.06	0.06	0.12
n-Heptane	0.06	0.05	0.11
Mcyclohexane	0.04	0.04	0.08
Toluene	0.03	0.02	0.05
n-Octane	0.02	0.02	0.04
E-Benzene	0.00	0.00	0.00
m-Xylene	0.01	0.01	0.02
p-Xylene	0.01	0.01	0.02
o-Xylene	0.00	0.00	0.00
n-Nonane	0.01	0.00	0.01
AAAF-Toluene	0.00	0.00	0.01
H2O	0.17	0.29	0.80

These cases are defining the Gas Range.

4.5 **Lubrication System**

4.5.1 The lubrication system shall be a pressure-type system. It shall consist of, but not limited to, the following:

- Sump (wet type) with level indication, fill filter, vented and valved drain.
- Circulation pumps (shaft driven) with pressure relief valve.
- Duplex filters with replaceable cartridge elements, full flow transfer valve and differential pressure gauge across filters.
- Cooling equipment with thermostatically controlled bypass valve.
- Valves for relief and pressure regulation
- Instruments
- Alarms, Low Level Alarm Switch
- Automatic shutdown devices

4.5.2 The oil sump shall be integral with the engine and shall be large enough to contain all the oil in the system when the engine and pumps are shutdown. The minimum capacity shall be an amount of oil equal to the lubrication pump's working capacity for a period of two minutes.

4.5.3 The filters for the lube oil system shall be sized to meet the engine manufacturer's required filtration for a minimum of 500 hours of continuous operation. The oil filter shall be equipped with a differential pressure gauge, and a bypass valve to assure engine oil flow in the event of filter plugging. All filters shall utilize replaceable elements. A Kenco or equivalent oil level regulator with block valves, and a 100 liter (30 gallon) lube oil storage drum with stand shall be provided on each unit.

4.5.4 If aluminum, micro-babbit or equivalent bearings are provided, a bypass filter rated for five (5) micron nominal filtration or better shall be provided. This bleed off filtration line shall be sized to filter the total oil capacity in 24 hours or less. Filter casings and heads shall be suitable for operation at a pressure of not less than 10 percent over the relief valve settings of the lube pumps.

- 4.5.5 Strainers (20 mesh) shall be provided in the lube oil pump suction header. The pump shall be driven by 24V DC batteries supplied with the generator sets.
- 4.5.6 Internal relief valves in filters shall not be acceptable.
- 4.5.7 Crankcase shall be explosion proof.
- 4.5.8 Pre-lube and/or post-lube pumps shall be provided. Pre-lube pump drivers shall operate on the same energy source as the engine starter.
- 4.5.9 The Supplier's standard pre-lube pump shall operate as follows:
 - 4.5.9.1 The pump shall run when automatically started by the engine-generator control panel.
 - 4.5.9.2 The pump shall run when the lube-oil heater is energized and allowed by the skid mounted ON/OFF selector switch.
 - 4.5.9.3 The post-lube pump shall be locked out from running when the engine is locked out manually.
 - 4.5.9.4 The pump shall be inhibited from running when the engine is running.
- 4.5.10 The VENDOR / SUPPLIER shall provide the recommended lubricant for start-up. The start-up lubricants shall not be those used during testing. Units shall be shipped dry.
- 4.5.11 The engine oil temperature shall not exceed the engine Manufacturer's recommendations and shall never exceed 91°C (195°F) for continuous operation. The oil temperature should never exceed 107°C (225°F) for short term operation (one hour or less) during an overload condition. The crankcase oil temperature shall be maintained at a differential of 6°C to 12°C (10°F to 20°F) above jacket water temperature under any conditions using jacket water cooling.
- 4.5.12 The crankcase oil temperature shall be maintained at a differential of 6°C to 9°C (10°F to 15°F) below jacket water temperature under any conditions when an oil cooler with a separate cooling water system is provided.

- 4.5.13 The lube oil dip stick shall be calibrated for oil pan level with the engine running and not running, to permit checking during normal operation and when the engine is stopped.

4.6 **Cooling Water System**

- 4.6.1 The engine shall be furnished with a closed loop, jacket cooling water system and a centrifugal, engine-driven jacket water pump. The cooling system shall be sized for the continuous maximum bhp load with stated ambient temperature.
- 4.6.2 The cooling water heat exchanger shall be of the finned radiator type. The radiator shall be mounted on the engine skid, and shall have a tin or solder coated core and shall have carbo zinc #11 on all exposed steel surfaces. The material shall be suitable for operation in a moist air environment. Coolant shall be compatible for operation within tropic locations as well. Radiator shall be filled out and sealed prior to test running. The cooling system shall include one (1) 1" stainless steel valve for external fill and one (1) 1" stainless steel valve for draining. System shall also include pusher type, engine driven fan, four ply hoses, water pump with carbon seal, and radiator fan guard. Radiator and fan selection shall be based on a -10°C (15°F) approach temperature. Dual cores may be used to provide jacket water and utility water circuits.
- 4.6.3 Automatic thermostat control with bypass valves shall be provided to control engine jacket water temperature. Bypass shall operate so that cooling water flow shall never be throttled. Expansion or surge tanks shall be integrally mounted.
- 4.6.4 Lube oil coolers may utilize jacket for cooling. Engine jacket water coolers may also be utilized to cool the generator lube oil system.
- 4.6.5 Thermometers shall be installed in 316L stainless steel thermowells at the inlet and outlet connection of each cooling water circuit in the heat exchanger (radiator). Thermometers shall be installed in such a way that they may be easily read from ground level without having to climb up on the skid assembly.

4.7 **Governor**

- 4.7.1 The governor supplied for engine speed regulation and load control shall be electronic utilizing digital technology.

- 4.7.2 The governor supplied shall allow for the operation of each generator individually as either an isochronous mode or a droop mode of operation. The governor shall also allow for the paralleling of two or more generators with load sharing.
- 4.7.3 The governor actuator shall be Woodward model (or equivalent) direct acting, UL Approved for use in Class I, Group C, Division 2. The actuator and magnetic pickup shall be mounted on the engine.
- 4.7.4 The amount of droop shall be field settable from 0 to 10%. The governor shall be provided with a droop reset control feature to maintain system frequency to within $\pm 0.5\%$ when in droop control.
- 4.7.5 The governor panels shall be mounted in the generator control panel. The generator control panel shall be located at a distance not exceeding 150 meter. The package Supplier shall supply interconnecting cables and cable connectors. A detail interconnection/wiring diagram and cable schedule shall be provided that details function of each cable.
- 4.7.6 The governor shall monitor the speed sensor for loss of speed signal, calling for minimum fuel when signal loss is detected.
- 4.7.7 The governor shall have the following adjustments:
- a) Rated speed
 - b) Idle Speed
 - c) Acceleration ramp time
 - d) Deceleration ramp time
 - e) Start fuel limit
 - f) Gain and reset
 - g) Actuator compensation
 - h) Load gain
 - i) Droop
- 4.7.8 VENDOR / SUPPLIER shall provide a ten (10) turn engine speed adjustable potentiometer (SAR) with locking mechanism. The engine speed shall be constant, regardless of load changes, once adjustments have been made. The SAR shall be integrated in the generator control panel.

4.8 **Engine Exhaust System**

- 4.8.1 The engine exhaust manifold shall be water cooled.
- 4.8.2 A muffler with spark arresting capability shall be installed in the exhaust system unless the pressure drop across the silencer raises engine exhaust pressure to unacceptably high pressure, in which case, a lower grade Maxim muffler may be used with Company approval.
- 4.8.3 Silencers with flange sizes over 15 cm (6 inches) shall be provided with an inspection opening or draw out cover.
- 4.8.4 Engine-mounted silencers shall be provided with a bellows-type, 316L stainless steel expansion joints.

4.9 **Insulation**

- 4.9.1 Thermal blankets shall be installed where surface temperatures exceed 60°C for personnel protection.
- 4.9.2 Ceramic fiber silicone treated glass cloth, covered with a 316L stainless steel knitted mesh good to 1260°C (2300°F) shall be provided on the exhaust line. A minimum of 2.5 to 4 cm (1 to 1-1/2 inch) calcium silicate covered with aluminum shall be provided where rigid insulation is required, such as on water lines.

4.10 **Engine Alarm and Shutdown Devices**

- 4.10.1 Each engine shall be equipped, as a minimum, with the following safety shutdown and alarming devices:
- Control switch not in auto (alarm)
 - High coolant temp (alarm and shutdown)
 - Low coolant temp (alarm)
 - Low coolant level (alarm)
 - High engine oil temp (alarm and shutdown)
 - Low, high, and weak battery voltage
 - Overspeed

- Overcrank
- Low fuel level (alarm)
- Low oil pressure (alarm)

4.10.2 Shutdown and alarm switch contacts shall have a minimum current rating of 5 amps at 24 VDC. Higher ratings shall be supplied when required by a particular service.

4.11 **Engine Instruments Panel**

4.11.1 A package mounted powder paint coated sheet steel instrument panel for engine-generators shall be provided. Panel shall be located on the edge of the engine skid so that it may be viewed from outside the enclosure and shall be mounted on isolation mounts in such a way as to prevent vibration damage to instruments. The instrument panel shall remain in place when the generator enclosure is removed. The following instruments shall be provided on the instrument panel as a minimum:

1. Lube oil pressure gauge
2. Electronic (LCD) tachometer
3. Engine outlet water temperature gauge
4. Engine outlet oil temperature gauge
5. Engine oil filter differential pressure gauge
6. Intake manifold vacuum/pressure gauge
7. Fuel pressure gauge
8. Running hour meters
9. Fuel filter differential pressure gauge
10. Engine inlet water temperature gauge
11. Cooler outlet oil temperature gauge
12. Gauges for diesel engines with after cooling
13. Red maintained mushroom head emergency stop pushbutton, hermetically sealed contacts

4.11.2 Gauges shall be provided with glycerin filled stainless steel cases with a 100 mm (4 in.) face.

- 4.11.3 Additional instruments required by the Supplier shall be provided. Instrumentation shall conform, in general, with API STD 670.
- 4.11.4 Instrumentation and associated local panel monitor for vibration, axial position, and bearing temperature shall conform, in general, with API STD 670.
- 4.11.5 All gauges shall have 10 cm (4 inch) diameter (minimum) faces, identification labels, including tab number, and normal and maximum reading markers. Pressure gauges shall have 316L stainless steel bourdon elements and 316L stainless steel cases. Thermometers shall be mounted in 316L stainless steel wells. Gas-filled thermometers shall have leads and shall be no longer than 3 meters (10 feet).

4.12 **Ignition System**

- 4.12.1 Engine manufacturer's standard, shielded, low tension, capacitive discharge ignition system shall be used. The system shall include the Altronic (or equivalent) ignition system.
- a) All cables and harnesses shall be shielded with stainless steel braid. Primary cables shall also be vinyl covered.
 - b) Ignition transformers shall be integral with the spark plugs eliminating the need for separate spark plug wires.
 - c) Engine manufacturer's standard electronic ignition diagnostic system shall be used.
 - d) Magnetos if used, coils, and plugs shall be certified by either IEC, U.L., C.S.A, or F.M.

4.13 **Miscellaneous Requirements**

- 4.13.1 Relief valves shall be provided as necessary for the fuel supply, engine crankcase pressure and lube oil supply.
- 4.13.2 Governor setting controls shall be mounted on the governor.

- 4.13.3 The engine over-speed shutdown will be easily accessible and capable of being manually tripped and reset with fuel pressure on the line. Trip mechanism shall be spark proof and suitable for use in hazardous locations. Trip device, valve, valve stem and packing and interconnecting linkage shall be of suitable material and so designed that they may be expected to perform satisfactorily under conditions of minimum lubrication, infrequent tripping and outdoor installation.
- 4.13.4 Automatic safety stops shall be entirely independent of the speed governor. They shall operate to ground the ignition, shut off the fuel and vent fuel from the engine.
- 4.13.5 Engine shall be provided with guards to protect persons or structures from rotating or heated parts. It is the responsibility of Supplier to specify and provide such connections and equipment.
- 4.13.6 Interlocks shall be provided to override shutdown signals when starting the engine.
- 4.13.7 Some means of positive fuel shut-off should be provided for emergency use. Pressurized fuel (Natural Gas) should have another shut off valve, preferably automatic, other than those in the carburetor or gas pressure regulator equipment.

5.0 **GENERATOR**

5.1 **General Requirements**

- 5.1.1 Synchronous generators and auxiliaries shall be capable of continuous operation for a minimum of three years without any maintenance shutdown in an outdoor, onshore, severely corrosive environment. Site environmental conditions are indicated on the data sheets and other documents attached.
- 5.1.2 All equipment supplied shall be designed to meet all requirements of this specification for continuous operation in stated ambient environment.
- 5.1.3 If the design dictates necessity for prototype equipment which has not been in service for at least two years, the bidder shall provide adequate documentation describing the particular components affected and the extent of experience with such parts. The Supplier must receive approval from Company prior to use of this equipment.

- 5.1.4 The generators shall be capable of withstanding a maximum single-line-to-neutral fault at its terminal for 30 seconds without damage, while operating with fixed full load excitation. In addition, each generator shall be capable of withstanding, for 10 seconds without damage, an excitation level in the field winding corresponding to a current of 300 percent of full load current, along with the short-circuit heating and forces in the armature windings.
- 5.1.5 All generators shall be labeled or listed by UL, FM, CSA or other recognized testing laboratory.

5.2 **Generator Requirements**

- 5.2.1 Synchronous generators shall be designed in accordance with the applicable codes and standards listed in section 2.0. Generators shall be suitable for outdoor installation and shall be capable of continuous duty service. The generators shall operate successfully at rated kVA, frequency, and power factor at any voltage between 5% above or below voltage, and be capable of providing continuous and reliable power.
- 5.2.2 Each generator shall be rated 400V, three phase, 50 Hertz, wye-connected, with a 0.80 rated power factor as indicated on the data sheets for this specification. Generators shall be solid grounded.
- 5.2.3 The generator shall be capable of withstanding 20% overspeed without mechanical damage. Generator rotation shall be dictated by the driver rotation. Phase sequence shall be U, V, W (R, S, T) with counterclockwise phase rotation when looking at the coupling shaft end. Phase conductors shall be color coded as red, yellow and blue for phases U, V, and W (R, S, T) respectively. Colored tape or heat shrinkable sleeves are acceptable.
- 5.2.4 The generator rotor shall be capable of withstanding, without injury, unbalanced short circuits or continuous unbalanced conditions on the system in accordance with NEMA MG-1 / IEC 60034.
- 5.2.5 The voltage waveform of each generator shall be near sine wave perfection. The harmonic content shall not be greater than 3% for any single harmonic and 5% for all harmonics for a 100% non-linear load. The deviation factor shall not exceed 5%. All generators shall be designed for parallel operation and shall have identical winding pitch.

- 5.2.6 Maximum phase to phase voltage deviation shall not exceed 1% of rated voltage with 5% unbalanced phase current present.

5.3 **Generator Sizing Criteria**

- 5.3.1 The generator nameplate power output rating at Class B temperature rise as measured by RTD shall be sized to exceed the maximum driver output by a minimum of ten (10) percent at the minimum design ambient temperature.
- 5.3.2 The generator shall be capable of withstanding, without mechanical injury for 30 seconds, a three phase short circuit at its terminals when operating at the highest capability kVA, rated power factor, and at 5% overvoltage. Each generator shall also be capable of withstanding, without injury, any other short circuit at its terminals of 30 seconds duration, or less provided the machine phase currents under fault conditions are such that the negative sequence current (I_2) expressed in terms of per unit stator current at highest capability kVA, and the duration of the fault in seconds (t) are limited to values, which given by the integrated product of $(I_2)^2t$ (negative phase sequence current squared times time), is equal to or less than 40. The criteria for no injury to stator windings is that the windings shall satisfactorily withstand a normal maintenance high potential test and there is no visible abnormal deformation or damage to the winding coils, wedges, blocking, lashings, connections or any other components of the generator.

5.4 **Insulation**

- 5.4.1 Each generator shall be designed for continuous operation at nameplate rating with an 80 degree C rise based upon a 40 degree C ambient and measured by embedded RTD. The generators shall be mechanically and electrically capable of operating at 15% overload continuously without exceeding the Class F insulation rating.
- 5.4.2 The stator winding shall be provided with a sealed insulation system to ensure an impervious seal against moisture and chemicals. Void-free vacuum/pressure impregnation of all windings is preferred.
- 5.4.3 The generator field winding, especially the end turns, shall be protected against shorts and damage caused by the corrosive atmosphere prevalent in petrochemical facilities.

5.4.4 All the generator leads or any bus bar extensions which form part of the generator lead extension shall be completely insulated for the voltage class and shall not compromise the integrity of the sealed insulation system specified in 5.4.2.

5.4.5 Insulation of the AC generator-rotating armature shall be Class F. Insulation of the stator and field windings shall be Class F. Temperature rise shall be limited to Class B during generator operation at maximum reactive capability.

5.5 **Stator Construction**

5.5.1 Stator lamination shall be high grade silicon steel, coated to be unaffected by normal temperatures encountered during operation and generator testing, segmented, rotated to reduce tolerance build up, rigidly mounted and tightly compressed to form a permanently clamped and rugged structure.

5.5.2 The stator coils shall be form wound with insulated copper bars bonded to each other. Separate turn to turn insulation shall be provided on each coil. Coil insulation shall be an all mica system, vacuum pressure impregnated with an epoxy resin and coating to suppress corona.

5.5.3 The stator core mounting shall be designed to absorb the vibrations caused by the rotating magnetic field.

5.5.4 The stator windings shall have two 100 ohm platinum RTD's per phase. These RTD's shall be wired to a separate junction box. Each generator unit control panel (UCP) shall contain temperature monitors for these RTD's.

5.5.5 Proposed and existing generators shall all have same winding pitch.

5.6 **Rotor Construction**

5.6.1 The rotor windings including connection rings shall be of copper and/or copper alloys.

5.6.2 Field windings shall be pressure heated to consolidate insulation and copper windings into a solid bonded condition. Special care shall be taken in assuring that the field ends are properly coated for making them resistant to corrosive attack.

- 5.6.3 VENDOR / SUPPLIER shall provide integral shaft hub flanges on generator shaft. The integral shaft flanges shall not interfere with rotor removal from stator or disassembly.

5.7 **Exciter**

- 5.7.1 Generators shall be furnished with a brushless excitation system consisting of a high frequency AC generator complete with a rotating fused diode assembly plus a self exciting permanent magnet generator (PMG) all mounted on the same outboard shaft end. The output of the rotating armature of the high frequency AC generator shall be rectified by a rotating full wave, 3 phase, bridge diode assembly and fed directly to the field windings of the synchronous generator. The rotating diode assembly shall contain fully-rated parallel redundant diodes (12 total). Each diode shall be protected by a fuse containing a "blown fuse indicator" to assist in locating shorted diodes. The stationary field windings of the high frequency AC generator shall be supplied by a varying DC current. This in turn shall control the output voltage of the main generator, by the solid state voltage regulators which receive the power from the self exciting PMG. The excitation system shall be provided with an exciter diode monitor to detect diode failure.
- 5.7.2 The rectifier system shall be capable of providing full excitation power with only 80% of the diodes per phase in operation.
- 5.7.3 The brushless exciter shall be equipped with surge protected silicon diodes, shall be hermetically sealed, shall have voltage rating 250 percent of exciter ceiling voltage and current capacity of at least 200 percent of normal requirements.
- 5.7.4 The generator excitation system shall be wide range, stabilized to permit stable operation down to 25% of rated excitation voltage. The excitation ceiling voltage obtainable shall be at least 120% of rated voltage when operating with a load resistance equal to the generator field and shall be capable of supplying this voltage under load for at least one minute. The exciter response ratio will be at least 0.5 for an error signal of 10 %. Terminal voltage shall be held within ± 0.5 % from no load to rated kW.
- 5.7.5 The exciter shall be sized to provide at least 20% excess capacity than that required to supply the field excitation when the generator is operating at its maximum continuous overload capability at rated power factor without exceeding the insulation Class B temperature rating.

- 5.7.6 The exciter shall be capable of withstanding 20% overspeed without damage.
- 5.7.7 Excitation support for short circuit current shall provide a minimum of 300 percent of rated current for 10 seconds under short circuit conditions. It shall support all three phase, phase to phase, phase to neutral faults.

5.8 **Voltage Regulators**

- 5.8.1 An automatic voltage regulator (AVR) shall be furnished. The automatic voltage regulator (AVR) shall be of solid state construction replaceable as an assembly. The voltage regulator shall provide automatic regulation within \pm one-quarter percent over the full range of generator loading at rated power factor, and within \pm ten percent voltage adjustment, from no load to rated load.
- 5.8.2 Response time required to establish stable voltage following any sudden change of load shall not exceed twenty-five milliseconds. The generator itself (including the brushless exciter time constant) shall respond and recover in less than 1.5 seconds.
- 5.8.3 In steady state operation, the voltage shall not vary with frequency change. An underfrequency protection circuit shall be provided in the regulator, so that when the frequency falls below the set point, the regulated voltage is modified on a volt per hertz basis. Protection shall be both automatic and adjustable.
- 5.8.4 Sudden application of nameplate KW at 0.8 power factor when the generator, exciter, and voltage regulator are operating at no load and rated voltage and frequency shall result in a voltage transient of less than $\pm 10\%$. Recovery shall be to within 6% of rated voltage in less than 1.5 seconds, with no more than one undershoot or overshoot.
- 5.8.5 The automatic voltage regulator shall have three phase sensing with the sensing circuit and control circuit isolated from power surges through the use of isolation transformers. The standard voltage reference shall be obtained from a zenor diode of low thermal coefficient with a drift of 1/2% or less in the regulator setpoint over an ambient temperature range of +20 C to +50 C. The change in voltage from initially regulated voltage shall not exceed $\pm 1/2\%$ of rated voltage for a constant load between no load to rated full load for any 30 minute period at a constant ambient temperature.

- 5.8.6 Phase to Phase voltage deviation shall not exceed 1% of Rated voltage with a 5% unbalanced phase current load.
- 5.8.7 The automatic voltage regulator shall include cross current compensation (reactive differential compensation) for parallel operation of multiple units to provide reactive load sharing within 5% of the nameplate rating. The voltage regulating system shall include a motorized voltage adjustment rheostat and generator control panel mounted voltage raise-lower switch. Provisions for droop control shall also be provided.
- 5.8.8 The voltage regulator shall be powered from the PMG.
- 5.8.9 All rectifiers used in the voltage regulator shall be hermetically sealed.
- 5.8.10 The equipment shall be mounted in the generator control panel.

5.9 **Space Heaters**

- 5.9.1 Each generator shall be supplied with anti-condensation space heaters, minimum two (2), spaced to prevent hot spotting. Generator space heaters shall be long life, rated 500 VAC, operated at 230 volts, single phase. The heater sheath maximum temperature shall not exceed 180 degree C for any value at or below maximum rated ambient temperature of 45 degree C and 120 percent of rated voltage. Space heater leads shall be terminated in a separate terminal box. The generator space heater shall be controlled by the generator PLC such that the heater is energized only when the prime mover is not operating.

5.10 **Current Transformers**

- 5.10.1 Generator phase differential, ground differential and/or ground overcurrent current transformers shall be supplied by the generator Supplier.
- 5.10.2 Current transformers used for the generator differential protection shall be accurate to within 1.5% up to twice the normal current ratings.
- 5.10.3 Current transformers shall be rated to withstand the thermal and magnetic stresses resulting from short circuit currents. Current transformers shall not saturate for the maximum values of available short circuit. Phase and differential current transformers shall have an accuracy class of C100 minimum in accordance with ANSI C57.13. Neutral current transformers shall have an accuracy of C50 minimum. Secondary circuits for current transformers shall be pre-wired and terminated using short circuiting terminal blocks and equipped with a secondary open circuit protector. All wiring for current transformers shall be 10 AWG (6 sq. mm) minimum and shall utilize full ring compression terminals.

5.11 **Thermocouples**

5.11.1 Individual thermocouples and wells shall be furnished at the below listed locations for remote indication and alarm.

- a) Generator bearings.
- b) Exciter bearings.
- c) Water discharge at each cooler section.
- d) Generator cooling air in and out of each cooler section.

5.12 **Limits of Noise**

5.12.1 In absence of any stated noise limits the maximum noise level at or beyond 1 meter from the machine surface shall not exceed 85 dBA when operating as an alternator at rated voltage, rated speed and off load.

6.0 **MECHANICAL DESIGN FEATURES**

6.1 **General**

6.1.1 All boxes for high voltage cables and low voltage or control wiring shall be extra large to provide ample room for terminating and bending cables. Boxes for power supplies shall be suitable for class 1, Division 2 group D hazardous location.

6.1.2 Terminal boxes shall be provided for all electrical connections, including incoming phase conductors, space heaters, winding temperature detectors, bearing temperature detectors, field leads, surge capacitors, lightning arresters, and current transformers.

6.1.3 Adequate space shall be provided in the oversized main terminal box for the installation and termination of incoming phase and neutral power cables/ busbars.

6.1.4 A terminal box on the outside of Gas Engine Generators shall contain, lightning arresters, and surge protection. The terminal box shall have adequate room for stress cones (42 inches minimum). The terminal box shall be offset from the generator so as not to interfere with rotor removal or other maintenance. Terminal box shall be located at the side of the generator enclosure unless otherwise specified. The terminal box shall be partitioned, or a separate box shall be supplied for surge capacitors, so that a blown capacitor does not damage phase and neutral buswork.

- 6.1.5 Lightning arresters shall be intermediate or station class and shall be rated for the generator line-line voltage as a minimum.
- 6.1.6 Boxes shall be provided with threaded conduit hubs or entrances. The generator field shall be wired to the package DC junction box. RTD's shall be wired to the package instrument junction box. A minimum of two conduit entrances shall be provided in all control wiring terminal boxes.
- 6.1.7 All control and low voltage wiring terminal boxes shall be located on the side of the generator enclosure and shall be NEMA 4, IP 65, powder paint coated sheet steel. The boxes shall be rotatable to allow connection from any one of four direction at 90 degree intervals.
- 6.1.8 Terminal blocks shall be provided for all low voltage and control wiring, shall be non corrosive type with nickel plated copper for current carrying components. Not less than 20% of terminal blocks on any strip shall be spare.
- 6.1.9 A cable and wire seal with separator neoprene gasket shall be provided between the generator frame and terminal box.

6.2 **Skid Conduit and Wiring**

- 6.2.1 All exposed conduits shall be schedule 40 rigid steel. Terminations to electrical equipment and devices may be liquid tight flexible type conduits with approved grounding fittings. Flexible conduits shall not exceed three feet in length.
- 6.2.2 All power and control wiring within the confines of the generator skid shall be heat, moisture, and abrasion resistant. Where rubber insulation is used, a neoprene or Hypalon jacket shall be provided for insulation protection. Within the confines of the baseplate and other areas subject to vibration, stranded conductors shall be used. All wiring shall of copper.
- 6.2.3 All conduits entering or leaving the engine fuel gas compartment shall be sealed. All seals shall be accessible. All cable and conduit installation shall be suitable for a Class I, Division 2, Group D area classification.

6.3 **Grounding**

- 6.3.1 Supplier shall provide suitable grounding pads for connection to ground grid using 120mm² to 240mm² stranded copper conductors. Two diagonally opposite ground pads shall be furnished on the generator and on the generator skid.
- 6.3.2 A separate grounding bus bar shall be provided inside the main terminal enclosure for grounding of power cable shields, power cable armor and integral ground wire, conduits and generator frame. The bar shall be tin-plated copper.

7.0 **NAMEPLATES**

- 7.1 Nameplates displaying the VENDOR's / Supplier's information shall be provided.
- 7.2 Nameplates identifying each assembly in accordance with the single-line diagram shall be provided.
- 7.3 Nameplates shall be provided to identify each circuit breaker, fuse, protective relay, meter, and all control devices corresponding with the information on the Supplier schematic and wiring diagrams. Devices mounted on doors shall have front and rear door mounted nameplates.
- 7.4 The nameplates shall be made of three-ply plastic laminate and mounted with corrosion-resistant screws or fasteners. Lettering shall be black on a white background.

8.0 **VIBRATION AND BALANCE**

- 8.1 The assembled rotor for the generator shall be dynamically balanced on multiple balancing planes at 120% of rated operating speed. Rotor shall be balanced with coupling hubs and shaft key, if integral flange is not provided. Final balance shall be performed after painting and baking.
- 8.2 Balance weights added to the final assembly shall be 300 series stainless steel. If parent metal is to be removed to achieve dynamic or static balance, it shall be drilled out in a manner not to cause harmful or distortive hot spots in operation. This procedure must be approved by the Company. Chiseling, grinding, sawing, or torch burning shall not be permitted. The use of solder or similar deposits for balancing only shall not be acceptable.

- 8.3 The rotor fans shall be balanced prior to installation on the rotor. During rotor balancing correction weights shall be added to the rotor body only and not to the fans.
- 8.4 During shop running tests of the assembled generator vibration measurement shall be taken with the generator leveled and rigidly bolted to a foundation or test stand floor whose natural frequency is removed by at least 25% from the rotational or twice line excitational frequencies. (Elastic mounts are not allowed)
- 8.5 The unfiltered vibration level (peak to peak) of the assembled generator operating at 120% of rated speed shall not exceed the above value plus 0.5 mil. The amplitude of any discrete nonsynchronous vibration shall not exceed 25% of the allowable vibration.
- 8.6 Filtered vibration readings shall be taken at one and two times operating speed frequencies, at twice line frequency, and at any other frequencies specified by Company. The vibration shall be within the limits specified through the temperature range from specified ambient to total design for a full temperature test. Axial vibration measured on bearing housings shall not exceed one half the radial vibration limits.

For machines where only bearing housing vibration can be measured, or for machines with antifriction bearings the unfiltered overall vibration in any plane shall not exceed 0.20 in. /sec. (5.0 mm/sec.). The amplitude of any discrete non-synchronous frequency peaks shall not exceed 0.10/in./s (2.5 mm/sec.).

- 8.7 Actual critical speeds shall not encroach upon specified operating speed. The amplification factor shall not exceed five while going through critical. This measurement shall be recorded on deceleration. These recorded shaft relative data shall include speed, peak to peak displacement, and phase. The separation margin of encroachment from all lateral modes (including rigid and bending) shall be at least 15% below any operating speed and 20% above the maximum continuous speed for flexible shaft rotor systems.
- 8.8 The VENDOR / SUPPLIER shall be responsible for performing a lateral and torsional critical speed analysis for the complete coupled train and for checking remedial measures. Generator Supplier shall provide necessary data and coordinate with the driver Supplier.

9.0 **BEARINGS AND SHAFT**

- 9.1 In general, anti-friction bearings shall be provided in accordance with ABMA 9 or ABMA 11. The bearings for generators 1500 kW and larger shall be of the standard babbitt lined, pressure lubricated, circulating oil cooled type, designed to prevent the emission of oil or vapor. Each journal bearing shall be horizontally split with self aligning spherical seat. Upper and lower halves shall be steel or bronze backed babbitt lined and bonded to the shell. The journal bearings shall be interchangeable insofar as possible and shall be designed so that they can be removed without disturbing the rotor.

The bearings for generators less than 1500 kW shall be a single bearing design, direct coupled to the engine driver. The bearing shall be a sealed, grease packed antifriction bearing. As an alternative, the Supplier may offer a split ring design that allows replacement of the antifriction bearing with the generator in place.

- 9.2 The generator shall be supplied with the Supplier's standard bearing required to meet vibration level limitations specified in this specification. Supplier shall provide the oil flow requirements and heat rejection for each type of bearing with quotation.
- 9.3 Each generator shall be provided with both bearings electrically insulated from the frame and bearing housing. Insulation resistance shall not be less than one megohm. Warning nameplates reading "Insulated Bearing" shall be mounted on or near all generator bearings that are electrically insulated from the generator frame. Terminal facilities shall be provided to permit direct resistance measurements for testing of the bearing insulation. Grounding provisions shall be provided for the inboard bearing. Generators less than 1500 kW may have only one insulated bearing.
- 9.4 Journal bearings shall be provided with two 100 ohm Platinum RTD's to measure bearing metal temperature. The RTD shall be within 1/4 inch of the bearing surface. The RTD's shall be wired to a separate terminal box and monitored by temperature monitors. Generators less than 1500 kW do not require bearing RTD's. RTD installation shall maintain integrity of insulated bearings.
- 9.5 The generator shaft shall be finished throughout its entire length and shall be ground at bearing and sealing surfaces and adjacent to the bearing surfaces, to permit vibration measurements. Plating of the shaft at the bearing areas is unacceptable.

- 9.6 The generator shall be designed to provide access for shaft vibration measurement by a hand-held probe adjacent to each bearing. Vibration monitoring shall be in accordance with API 670.
- 9.7 Each journal bearing shall be furnished with an air pressured seal to prevent oil and oil vapor from reaching the generator internals. Adequate drains for end leakage oil, and proper relieving to prevent oil whirl shall be provided. Labyrinth seals at the shaft entrance shall be provided.
- 9.8 The Supplier shall specify the maximum rotor end float and maximum coupling end float. The generator shaft position when magnetically centered and rotor end play limits shall be permanently scribed on the shaft. A suitable permanent reference point shall be indicated on the bearing housing.

10.0 **JOURNAL BEARING LUBE OIL SYSTEM**

- 10.1 Generator bearing lube oil shall be supplied from the engine lube oil system. The supply pressure at each bearing shall be 20 psig unless specified otherwise by Supplier having total unit responsibility.
- 10.2 The Supplier shall furnish single feed and drain header connections for each oil circuit. Lube oil piping shall be 316L stainless steel.
- 10.3 Flow indicators and temperature gauges shall be furnished in the atmospheric oil drain return line from each bearing. Each flow indicator shall be of the bull's eye type (Jacoby Tarbox) and shall be installed with its bull's eye glass preferably in a vertical plane to facilitate viewing the flow of oil through the particular line.
- 10.4 When self lubrication is the Supplier's standard generator design, sleeve bearings shall be lubricated by oil rings supplied from an adequate integral self cooled oil reservoir. Oil level sight gauges with permanently marked, easily discernible indication of proper oil level shall be provided. Inspection openings for observing the oil rings shall also be provided. Ring oil lubricated sleeve bearings other than the pressure fed types shall be fitted with Trico or equal constant level oilers. Sleeve bearing generators shall be provided with labyrinth protection against sand and dust conditions.

10.5 The engine generator package lubrication system shall be designed to protect the generator bearings during a black start condition and during a run down. Supplier shall supply emergency lube oil pumps driven by 24 Volt DC motors for these conditions. These rundown pumps will be fed from a dedicated battery. Gravity fed run down systems are not acceptable. Supplier shall be responsible for determining battery size required for the run down pumps. Generator Supplier shall oversize batteries by 125%. The Supplier shall supply the 24 volt DC motor starters for the run down lube oil pumps. The 24 volt DC motor starters shall be Supplier's standard supplied in free standing IP-55 enclosure in accordance with IEC-60529.

11.0 **FABRICATION**

11.1 **Piping**

- 11.1.1 Piping layout shall ensure that all control valves and operating valves are located within easy reach. Special attention shall be given to ease the operation and maintenance of the unit, and all equipment subject to frequent maintenance or adjustment shall be readily accessible. All units piping shall be prefabricated and shop assembled in accordance with the Technical Requirements.
- 11.1.2 An automatic air vent valve shall be provided at the high point in the jacket water system.
- 11.1.3 All small piping, such as drain and vent piping shall be grouped and located to provide maximum access for maintenance.
- 11.1.4 All hydrocarbon and lube oil piping shall be 316L stainless steel, excluding proprietary piping. All rubber hoses shall be replaced by 316L stainless steel braided hoses, which shall be adequately supported. All piping over 5 cm (2 inch) shall be welded. Piping below 5 cm (2 inch) shall be socket welded or seal welded. Flexible lines shall be braided stainless steel with flanged (ANSI 150 RF) ends. Stainless steel tubing shall be seamless 316L stainless steel. Tubing connections shall be 316L SS Swagelok or equivalent. Threaded connections are permissible only at compressor bosses, servicing points, or when threaded construction is the only available option.

11.2 Skid and Enclosures

11.2.1 General

- 11.2.1.1 Welding shall conform to AWS D1.1. All joints and points of contact between adjacent surfaces shall be seal welded to minimize corrosion.
- 11.2.1.2 For structural steel skids, ASTM A36/A36M domestic steel or Company approved equal shall be used. Mill certificates shall be provided.
- 11.2.1.3 As a minimum, 33 percent of all 100 percent full penetration structural welds shall be ultrasonically inspected as agreed with the Company. All other welds shall be 100% visual and MPI tested.

11.2.2 Skid Design

- 11.2.2.1 The engine-generator shall be mounted on a structural steel skid designed to ensure shaft alignment within engine and generator manufacturer's specifications. The skid shall be of sufficient rigidity to maintain alignment independent of skid support.
- 11.2.2.2 Engine-generator skids shall contain an integral, steel plate drip pan. The pan shall extend to all extremities and shall have a 50 mm (2 in.) minimum slope to a 50 mm (2 in.) collar welded into the pan at the skid edge. The pan shall be double side seal welded and the drain hole shall be located at the bottom of the lowest point of the pan. Each blind or inaccessible area that cannot be sandblasted and coated shall be sealed off with strap or plate. A removable stainless steel screen shall be installed in the drip pan drain opening.
- 11.2.2.3 Lifting eyes, pad eyes, or lifting holes shall be provided for lifting the entire engine-generator package without disassembly of any package components. The engine-generator package lifting points shall be clearly identified.

- 11.2.2.4 The skid shall be equipped with a lifting padeye at each corner. Padeyes shall be designed to carry at least twice the shipping weight of the skid package. If spreader bars are required for lifting, they shall be furnished complete with slings and shackles.
- 11.2.2.5 No items, including drain/vent pots, piping, or electricals shall be internally incorporated into the fabrication of the skid.
- 11.2.2.6 All mounting hardware for the engine/generator set shall be stainless steel.
- 11.2.2.7 Where necessary, platforms and ladders shall be provided to allow access to machinery components and accessories.

11.2.3 Enclosures

- 11.2.3.1 The generator sets shall be designed and provided with protection against chemicals, corrosion, high humidity conditions and fungus.
- 11.2.3.2 Each engine-generator unit shall be closed air circuit cooled or IC3A1 with filters at inlet of generator and also at the inlet of the canopy.
- 11.2.3.3 The engine/generator skid shall be covered with an acoustic canopy that is removable in sections. The generator end of the enclosure shall be entirely removable to allow the generator to be removed vertically. Each section shall have all necessary handles for lifting with mechanical devices. The enclosure shall be made of powder paint coated sheet steel panels with rigid mineral wool soundproofing insulation held in place by stickpins and perforated paneling. Stainless steel plates, metric 3.2 mm (1/8 inch) thick, shall be installed between the perforated paneling and any equipment mounted on the walls and ceiling. Equipment shall not be mounted directly to the perforated paneling. The enclosure and all enclosure doors shall be of sufficient size to allow access for all routine maintenance without removal of any part of the enclosure, (e.g. oil change, solenoid replacement, V-belt adjustment, coolant refill, etc.).

- 11.2.3.4 A permanent stainless steel nameplate shall be placed near each enclosure lifting eye stating that the lifting eye is only for lifting the enclosure and not the engine-generator skid.
- 11.2.3.5 The enclosure shall be furnished with the following systems as a minimum:
1. Ventilation (maintain 15°F differential).
 2. Lighting and receptacles. Enclosure lighting shall be fluorescent and listed for Class 1, Zone 2 operation. To facilitate enclosure removal, lighting circuits shall be wired through a 220V AC interlocked plug and receptacle. Lighting shall be powered from Customer lighting system when available.
- 11.2.3.6 The engine / generator enclosure shall be designed to ensure complete access to all equipment for inspection and maintenance. Removable side and roof panels shall be provided. Panels shall be lightweight, complete with weatherproof seals, and removable without disconnecting any internal systems. A minimum of one hinged door shall be provided on either side of the enclosure for easy access.
- 11.2.3.7 Ventilation design shall be submitted to Company for review and approval.
- 11.2.3.8 The enclosure shall attenuate the sound emission level to 85 dBA at a distance of 1 meter (3 feet) from the enclosure at a height of 1.5 meters (5 feet).
- 11.2.3.9 Doors shall be attached with grade 316L, stainless steel hardware with removable hinge pins. Double doors shall be provided on both sides at the engine end and at the generator end. All exterior hardware shall be grade 316L, stainless steel. All doors shall have panic hardware on the inside and a heavy-duty pull-to-open handle on the outside.
- 11.2.3.10 The enclosure panels shall be removable without disconnecting any external or internal piping, tubing or electrical wiring pertaining to the engines and generators with the exception of the exhaust system, and wiring for the lighting and fire/gas detection system.

- 11.2.3.11 Individual panels weighing more than 45 Kg (100 pounds) shall be provided with permanently attached lifting eyes on the outer side.
- 11.2.3.12 All enclosure penetrations including door openings shall be flashed weather tight.
- 11.2.3.13 All door openings shall have a powder paint coated sheet steel rain shield mounted above the opening.

11.3 **Miscellaneous**

- 11.3.1 A removable flywheel guard, bolted directly to the skid, shall be provided along with adequate lifting lugs. All special tools and wrenches required for engine installation, operation and maintenance shall be provided with the unit.
- 11.3.2 A 3.5 mm (10 gauge) steel drip pan shall be installed to cover the area under the engine. The pan shall be smooth, sloped to a point on one side (or end) of the skid, and shall terminate at the skid edge in a 5 cm (2 inch) NPT, plugged connection.
- 11.3.3 The engine manufacturer shall provide a torsionally compatible, non-lubricated, flexible, non-spacer type coupling between engine and generator. Spark-proof coupling guards shall be provided for each coupling.
- 11.3.4 Engine nameplates shall be provided with engraved or stamped rating data, firing order, and serial number. Rotation arrows shall be provided.

12.0 **ENGINE-GENERATOR CONTROL AND SWITCHGEAR**

12.1 **General**

- 12.1.1 Generator Control Panels shall include, but not be limited to, the following equipment. Any additional equipment for the required operation and control shall also be supplied. All other relevant requirements mentioned in the scope of work 165-2-SPE-016 shall also apply.
 - a) Driver and generator control, monitoring, alarm & protections including temperature monitoring equipment.
 - b) Governor

- c) Automatic voltage regulator and reference adjuster.
- d) Starting sequencer
- e) Exciter diode monitoring system.
- f) Canned message display with first out annunciation.
- g) Excitation limiter
- h) Overspeed switch
- i) Automatic generator loading control.
- j) Generator paralleling / load sharing facility.
- k) Remote Start-Stop Manual / Auto / Remote Controls.

Individual control switch for each circuit breaker capable of being controlled from the generator control panel.

- 12.1.2 Each generator control panel shall be a free standing IP42 enclosure, completely factory assembled, wired, and tested. Panels shall require front access only.
- 12.1.3 Panels shall have removable lifting angles or eyes and a channel base suitable for rolling or skidding. Panels shall be supplied with an isolated instrument copper ground bus and an enclosure copper ground bus. The panel shall be suitable for field wiring to enter from either above or below. Removable gland plates shall be supplied for incoming metal clad field cable termination.
- 12.1.4 Each generator control panel shall be provided dual 230VAC control power feeders from UPS system which will be provided by COMPANY. The generator control panels shall be equipped with dual regulated power supply units for the required panel control power. Control Power shall be 24V DC and arrangement of voltage level other 230V AC will be provided by Contractor.
- 12.1.5 Fuses, switches, and other miscellaneous accessories shall be located inside the panel such that all equipment can be easily serviced and maintained.

12.2 **Generator Protection**

12.2.1 Generators shall be provided with sufficient devices to protect the unit as required by the Supplier and the specifications. Following are the minimum requirements

- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under frequency (81 O/U)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)
- Negative Phase Sequence Relay (46)
- Check Synchronizing Relay (25)
- Field Failure (loss of excitation) Relay (40)
- Machine thermal Relay (49)
- Earth Fault Relay (64)

12.3 **Engine Protection**

12.3.1 The engine shall be provided with sufficient devices to protect the unit as required by the Supplier, the single-line drawings, and the specifications of Tender Document.

12.3.2 Engine protection shall include, as a minimum, the safety controls listed in section 7.5.4 of Scope of work 165-2-SPE-016.

13.0 **COUPLINGS**

- 13.1 The generator and engine shall be direct coupled.
- 13.2 Torsionally resilient close couplings shall be used for generator drives.
- 13.3 Couplings shall be sized to transmit a minimum of twice the rated torque of the driven equipment, continuously.
- 13.4 The engine Supplier shall furnish both coupling halves mounted on the corresponding shafts.

14.0 **INSPECTION AND TESTING**

14.1 **General**

- 14.1.1 Inspection and testing shall be provided in accordance with the Technical Requirements. The following tests are the minimum required to establish proper operation of the complete generator set and control panel prior to shipment. Supplier shall provide all manpower, utilities and fuel necessary for testing.
- 14.1.2 All equipment, labor, and accessories required to perform tests and Inspection and Test Plan shall be furnished, including power and control wiring between control panels, VENDOR supplied test switchgear or breaker, engine generators, coolers, load banks, etc. All process connections including fuel supply to engines, piping to coolers, etc. shall also be provided.
- 14.1.3 Test procedures shall be established and submitted to Company prior to award of the order.
- 14.1.4 Acceptance of factory tests shall not constitute a waiver of requirements to meet site tests under specified operating conditions, nor does inspection relieve the VENDOR of total responsibility.
- 14.1.5 Test pressures shall be maintained for a minimum of thirty minutes but with sufficient time to permit complete examination of parts under pressure. Test pressures shall be approved by Company.

14.2 System Testing

- 14.2.1 All systems shall be tested before shipping and shall be operating properly at time of shipment.
- 14.2.2 The VENDOR / SUPPLIER shall make a preliminary test run and complete all mechanical and electrical checks before any witnessed testing.
- 14.2.3 Each engine-generator shall be load tested as indicated in the following table:

Load	Duration
50% load	1 hour
75% load	1 hour
100% load	4 hours
110% load	1 hour
Load	Duration
50% load	1 hour (parallel operation)
75% load	1 hour (parallel operation)
100% load	1 hour (parallel operation)

- 14.2.4 The load test shall be continuous. Any stoppage shall require re-initiation of the entire test.
- 14.2.5 The engine-generator package shall be tested as a complete system including all components, control panels, cooling, exhaust, and fabricated systems. Readings shall be recorded every fifteen minutes. Any circuit breaker and generator protection for testing purposes shall be provided by VENDOR.
- 14.2.6 VENDOR shall supply adequate 24 VDC control battery and chargers for tests.
- 14.2.7 VENDOR shall have load bank(s) available at his testing facility for generator test purposes. Dry-type load bank(s) shall be capable fully loading generator to 110% capacity at 0.8 power factor. Unity power factor load banks are only acceptable if 0.8 power factor load banks are not available. For onsite similar Load Banks to be arranged by Vendor/Supplier.

14.2.8 All testing shall be completed to Company's satisfaction. Repetition of unsatisfactory tests shall be at VENDOR's expense.

14.2.9 Upon completion of tests, VENDOR / SUPPLIER shall submit to Company a written record of all test results.

14.3 **Generator Tests**

14.3.1 The generator shall receive the high potential insulation tests at factory. Tests shall be performed at manufacturer's recommended test voltage on both stator and field windings. Certification that megger or high pot tests have been performed shall be provided with test data indicating voltage applied and the duration of the test.

14.3.2 Prior to performing load test as described below, the following winding and insulation resistance tests shall be performed:

- a) Stator winding resistance and insulation resistance.
- b) Rotor winding insulation resistance.
- c) Insulation resistance of all associated electrical equipment on generator skid.

Insulation resistance tests shall be performed at the manufacturer's recommended test voltage and in strict accordance with manufacturer's instructions. If stator or rotor insulation resistance measures less than the minimum value specified by the manufacturer, windings shall be dried in accordance with manufacturer instructions until at least the minimum recommended resistance value is obtained.

14.4 **Engine Tests**

14.4.1 All parts of the engine and its auxiliaries which are subject to cooling water pressure during operation shall undergo a witnessed hydrostatic test of at least 1-1/2 times the maximum allowable working pressure for ½ hour without leakage.

14.5 **Coupled Engine-Generator Tests**

- 14.5.1 The generator set shall be connected with the unit control panel to simulate final installation, and shall receive a run test at synchronous speed for a minimum of two (2) hours, continuous, at full rated voltage and kilowatt capacity. Each half hour, amperage, voltage, frequency, power factor, cooling water and oil temperatures, oil pressure, fuel pressure, fuel consumption, ambient air temperature and engine speed shall be recorded.
- 14.5.2 The test shall not start until after the engine has run for 30 minutes at rated bhp and rpm, and after jacket water and lube oil temperatures have leveled off and stabilized.
- 14.5.3 The operation of protective devices shall be checked after completion of the two hour test to prove each alarm and shutdown device functions properly, and that the shutdown devices shutdown a fully loaded generator set. Each panel shall be fully tested to verify complete operability.
- 14.5.4 The engine shall be block loaded with 100 percent load twice and 50 percent load twice. Voltage, current, and frequency shall be recorded before and immediately following the block loading.
- 14.5.5 The generator set shall be cold started three times.

14.6 **Test Witness/Reports**

- 14.6.1 Company shall have the prerogative to witness any or all test.
- 14.6.2 Certified test reports shall be submitted for each test performed.

15.0 **GUARANTEE**

- 15.1 Supplier guarantees that each item provided will be free of defects in design, material and workmanship. The guarantee shall apply to discrepancies and defects that are discovered within the shorter of 12 months after final acceptance, or 18 months after being received at the jobsite. If corrective work is performed on an item under this guarantee, the guarantee shall also apply to discrepancies and defects in the corrective work that are discovered within the shorter of 12 months after the corrected item is again placed in operation, or 18 months after completion of the corrective work. These guarantee terms shall be extended for any period that an item cannot be operated as a result of discrepancies or defects in any item.

15.2 In addition, VENDOR / SUPPLIER shall disclose to company each proposed design, manufacturing procedure, material, component, or assembly which does not have at least 2 years' satisfactory field-operating experience in similar service. If VENDOR / SUPPLIER fails to make such disclosure to Company in writing prior to accepting a purchase order, the warranty shall be extended for 2 additional years beyond that specified above, and the warranty obligations shall be expanded to include payment of all direct costs to Company that may result from the use of such procedures, materials, components, or assemblies. Direct costs include, but are not limited to the following:

- Replacement parts
- Field labor required for removal and re-installation
- Factory labor to complete repair
- Shipping and freight
- Inspection and testing

Alternately, Company reserves the right to reject the item of equipment. If Company elects this option, Supplier shall bear all costs to provide equipment having two years' satisfactory operating experience in similar service.

16.0 **PREPARATION FOR SHIPMENT**

16.1 Each unit shall be suitably prepared for the type and mode of shipment specified. The preparation shall be suitable for up to 6 months of outdoor storage from the time of shipment in a manner requiring no disassembly prior to operation.

16.2 The VENDOR / SUPPLIER shall provide the Company with the job site storage instructions for the generator sets.

16.3 Preparation for shipment shall be as specified in the following paragraphs as a minimum.

16.3.1 Exterior surfaces, except for machined surfaces, shall be primed and painted.

16.3.2 After having been thoroughly drained and cleaned, internal areas of bearings and all auxiliary equipment in oil lubrication systems using carbon steel shall be coated with a suitable oil- soluble rust preventive.

16.3.3 Flanged openings shall be provided with metal closures at least 5 millimeters thick, with synthetic rubber gaskets. At least four full-diameter bolts shall be used for flanged openings.

- 16.3.4 The equipment shall be mounted on a rigid skid suitable for handling by forklift truck or crane.
 - 16.3.5 The rotor of sleeve-bearing generators shall be blocked to prevent axial and radial movement.
 - 16.3.6 Space heater leads shall be accessible without disturbing the shipping package. The leads shall be suitably tagged for easy identification.
 - 16.3.7 Lifting points or lugs shall be clearly marked.
 - 16.3.8 Open ends of tubes and pipes shall be capped. Taping is not adequate for protection.
 - 16.3.9 Exhaust silencer openings shall be wrapped with plastic to prevent the entrance of rain.
 - 16.3.10 All doors shall be locked closed. Keys shall be securely attached to the skid. Duplicate keys shall be given to the Company during testing.
 - 16.3.11 Separate control panels shall be crated and wrapped with plastic to prevent the entrance of moisture. Shipment by water requires waterproofing.
 - 16.3.12 All field openings in generator skid or enclosure, such as those for bus duct, cable bus, or multi-cable transits, shall be filled for shipment using marine grade plywood.
- 16.4 The generator shall be properly identified with item number, serial number and any other information required by the purchase order. All material shipped in separate crates shall be suitably identified with securely affixed, corrosion-resistant metal tags indicating the item and serial number of the equipment for which it is intended.

The fit-up and assembly of machine-mounted piping and other equipment shall be completed in the Supplier's shop before shipping.

17.0 **START-UP ASSISTANCE**

A qualified service technician / expert shall provide start-up assistance.

18.0 **DRAWINGS AND OTHER DATA**

18.1 The following minimum drawing information shall be included on the outline drawings and on other drawings and data as applicable:

1. Order and project number.
2. Equipment tag numbers and engine serial number.
3. Weights of engine, generator, gears, and the heaviest piece of equipment that must be handled for maintenance and erection.
4. All principal dimensions, including those required for foundation and piping design.
5. Direction of rotation.
6. All horizontal and vertical clearances necessary for dismantling.
7. Size, type, and location of all minor and major pipe connections, including vents, drains, lubricating oil, instruments, and controls. The use of all openings, including those to be plugged, shall be identified.
8. Auxiliary piping, fittings, or equipment furnished by the Supplier.
9. Make, size and type of couplings. The location and size of coupling guards shall also be indicated.
10. List of reference drawings.
11. Thermal and mechanical movement of shafts and connections.
12. Location of center of gravity of engine, generator, and overall packaged unit.
13. Electrical drawings.

18.2 Instruction manuals describing installation, operation, and maintenance procedures including all auxiliaries and instruments shall be furnished. The manual shall:

1. Be organized and indexed by principal equipment items and systems.

2. Include written instructions covering startup, normal shutdown, emergency shutdown, operating limits, and routine operational procedures.
 3. Include written sequence of installation and final tests and checks for equipment furnished by Supplier.
 4. Describe engine construction features and the functioning of component parts or systems (governor, lubrication, over-speed protection, etc.)
 5. Include outline and cross sectional drawings, schematic and illustrative sketches in sufficient detail to identify all parts, and show clearly the operation of all equipment and components and the methods of inspection and repair.
 6. Include instructions for erecting, piping, aligning, and preparing the engines and auxiliary equipment for use.
 7. Describe rigging procedures, methods of disassembly, repair, adjustment, inspection, and re-assembly of auxiliaries and engines.
 8. List fit-up, clearances, and balancing data needed for maintenance and repairs.
- 18.3 A spare parts list shall be submitted for all equipment supplied and shall include patterns, stock, or production drawing numbers and materials of construction. The list shall completely identify each part so that Company may determine part interchangeability with other equipment furnished by the same Supplier. Anti-friction bearings and other standard purchased items shall be identified by the original manufacturer's number and class of fit where number alone does not provide sufficient identification.
- 18.4 Supplemental spare parts lists shall also be provided and shall include recommended spare parts for commissioning and two years operation.
- 18.5 Include manuals and drawings for generator and generator control panels.



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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

SPECIFICATION FOR DIESEL ENGINE GENERATORS



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Rev.	Date	Description	Prepared By	Checked By	Approved By

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1.0 **SCOPE**

1.1 This specification covers the minimum basic requirements for the engineering, design, manufacturing, inspection, testing, commissioning and supply of diesel engine generators with its control panel and all accessories as specified herein and in the data sheets 165-2-DSE-002.

1.2 **Definitions**

Following definitions apply throughout this document:

COMPANY: Oil & Gas Development Company Ltd. (OGDCL)

VENDOR / SUPPLIER: The organization, firm or agency with whom order for the supply of equipment and or material has been placed.

1.2 **Errors or Omissions**

1.2.1 The review and comment by the Company or its representative of any Supplier's drawings, procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Supplier of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

1.2.2 Any errors or omissions noted by the Supplier in this Specification shall be immediately brought to the attention of the Company.

1.3 **Deviations**

All deviations to this specification, other specifications or attachments shall be brought to the knowledge of the Company in the bid. All deviations made during the procurement, design, manufacturing, testing and inspection shall be with written approval of the Company prior to execution of the work. Such deviations shall be shown in the documentation prepared by the Supplier.

1.4 **Conflicting Requirements**

In the event of conflict, inconsistency or ambiguity between the contract scope of work, this Specification, National Codes & Standards referenced in this Specification or any other documents, the Supplier shall refer to the Company whose decision shall prevail.

2.0 **CODES, STANDARDS AND SPECIFICATIONS**

2.1 **Codes, Standards and Regulations**

The Diesel Engine Generator 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):

2.2 **ANSI - American National Standards Institute**

ANSI C57.13	Standard Requirements for Instrument Transformers
ANSI C50.10	Rotating Electrical Machinery – Synchronous Machines
ANSI C50.13	Rotating Electrical Machinery – Cylindrical Rotor Synchronous Generators

2.3 **NEMA - National Electrical Manufacturers Association**

NEMA MG 1	Motors and Generators
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2.4 **NFPA - National Fire Protection Association**

NFPA 70	National Electrical Code
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2.5 **BS – British Standards**

4999	General Requirements for Rotating Electrical Machines
7671	Requirements for Electrical Installations

2.6 **IEC – International Electrotechnical Commission**

60034	Rotating Electrical Machines
60072	Dimensions and Output Ratings for Rotating Electrical Machines
60079	Electrical Apparatus for Explosive Atmospheres
60085	Thermal Evaluation and Classification of Electrical Insulation
60185	Current Transformers
60529	Classification of Degree of Protection Provided By Enclosures
60909	Short-Circuit Calculation in Three –Phase A.C. Systems

Equivalent codes can only be used on the approval of the COMPANY

The governing body for electrical codes and standards used in this project shall be the International Electrotechnical Commission (IEC).

Wherever this specification refers electrical scope to the NEC it is the Supplier's responsibility to adopt the equivalent IEC codes and standards and to request written approval from the COMPANY if there are to be any exceptions to IEC codes and standards.

3.0 **DESIGN AND CONSTRUCTION**

3.1 **General**

3.1.1 The Diesel generator set and auxiliary equipment shall be supplied by a Supplier qualified by a minimum of five (5) years of experience in manufacturing units of comparable rating at the proposed point of manufacture. Only Diesel generator, which has a proven satisfactory history of operation for at least five (5) years, will be considered.

3.1.2 The following items shall be included for generator package, as a minimum requirement: The requirements are not exhaustive and shall be read in conjunction with Scope of Work document.

- One Diesel Engine driving the Generator
- Alternator and associated excitation system and voltage regulator
- Exhaust ducting/pipe
- Inlet air filter
- Generator control panel with monitoring instruments (oil and water temperature and pressure gauges, switches and control and shutdown facilities etc.) as per minimum requirements mentioned in specifications or data sheets.
- Generator protection switchgear
- System Earthing
- Starter, Batteries and battery charger
- Wiring of on skid equipment to any on-skid panels and devices
- Diesel day tank with complete piping.
- Diesel Sub Base Tank
- Special tools and spare parts required for initial commissioning
- Factory Testing
- Preparation for shipment
- Documentation
- Pre-commissioning, Commissioning, Site and performance testing

3.1.3 The package shall be suitable for Prime power generation and shall be capable of producing the required power at site ambient conditions and 0.8 power factors as indicated on the data sheets. The unit shall include, but not be limited to, the components described in this specification, and the Diesel Engine Generator Data Sheet.

- 3.1.4 All materials, equipment and parts comprising the units specified above shall be new, and of current manufacture.
- 3.1.5 Equipment shall meet all applicable codes, including those listed in Section 2. Proven standard SUPPLIER equipment supply shall be considered as an option.

3.2 **Generator Design**

- 3.2.1 The generator shall be a 400V, three-phase and Neutral, 50Hz brushless, synchronous type built to IEC codes and standards.
- 3.2.2 The insulation system, including leads, shall consist of low-hygroscopic material. The system shall be Class F insulation with tropicalization and anti-fungus treatment. The temperature rise, above an ambient of 40°C, shall not exceed 80°C.
- 3.2.3 The generator shall have two (2) stator winding RTDs per phase. Each generator bearing shall have one RTD. The RTD's shall be platinum, 3 wires, 100 ohms (Ω) at 0° C.
- 3.3.5 The generator final power connection shall be a 6-lead machine for single and 3-phase load. The generator stator winding shall be a 6-lead unit. The leads shall be brought out in a sheet metal, termination chamber. Entry into this chamber shall be possible through the top, sides or bottom.

Generator stator leads shall be WYE connected to copper bus bars in the generator terminal box. The neutral shall be insulated from the frame. The bus bars shall be rigidly attached to the generator using insulators of adequate strength. The bus bars shall be drilled for field connection of cable/lugs as specified. Burrs shall be removed from the drilled holes.

- 3.3.6 Wiring connections shall be from the side or bottom.
- 3.3.7 Proven supplier standard will be considered as an option.

3.3 **Diesel Engine**

- 3.3.1 Diesel engine, four-cycle, medium speed operation, turbo-charged, complete with auxiliaries as described herein. Design, construction and performance shall be in accordance with the manufacturer's proven standard and shall be capable of supplying the output of the generator and all driving auxiliaries.

- 3.3.2 The diesel engine shall be wired to start automatically on the power failure.
- 3.3.3 The maximum starting time to reach rated speed shall not exceed 20 seconds. Starting shall be with no load until the transfer circuit frequency and/or voltage relays permit the application of load.
- 3.3.4 The driver shall have a running time between major overhauls of 15,000 hours minimum as indicated by engine hour-meter. Exhaust shall meet current exhaust and emission standards as per local regulations.
- 3.3.5 Balance adjustment shall be made only by addition of weights. Generators shall have provisions for possible future rotor balancing in a maintenance shop by the addition of weights.
- 3.3.6 The generator shall have two (2) stator winding RTDs per phase. Each generator bearing shall have one RTD. The RTD's shall be platinum, 3 wires, 100 ohms (Ω) at 0° C.
- 3.3.7 Hoses made of rubber, synthetics and other materials susceptible to heat damage and atmospheric deterioration shall not be used for fuel, lube oil, and other hydrocarbon lines on engines. Where flexible pipe connections are required, braided, corrugated or all metal stainless steel hose that is rated to withstand the system operating pressure at a temperature of 650 °C or higher shall be used.
- 3.3.8 Engine intake air filter shall be a combined pre-cleaner (e.g., inertial separator) and dry filter arrangement with a local differential pressure indicator. An insect screen shall be installed ahead of the intake air filters.
- Intake ducting or piping shall be properly supported to prevent excessive strains being applied to the intake nozzle on the engine. Expansion bellows provided by the engine Supplier shall be installed in the locations approved by the engine Supplier.
- 3.3.9 Generator shall be supplied with space heaters. The supply voltage will be found on the data sheets. The heaters shall protect the generator from condensing moisture and shall be switched on automatically when the generator is not running.
- 3.3.10 Overspeed trip will be set at 115%.

- 3.3.11 The Diesel Generator set, including the local gage panel / control panel and radiator, shall be mounted and shipped on a single steel skid, and shall be provided with suitable vibration dampers.
- 3.3.12 A DC electric starting system with a positive engagement drive shall be furnished. In addition to automatic start-stop sequences controlled by the Control Panel, manual start-stop shall be provided with adequate overrides in the generator control panel. Automatic controls shall be provided for starting and exercising. A cycle cranker for up to three (3) cranks, with two (2) rest periods shall be provided. Alarm contacts shall indicate start-up and failure to start (at the end of the sequence).

3.4 **Fuel and Fuel System**

- 3.4.1 Using Diesel fuel, the engine shall be capable of starting and operating at the minimum site ambient temperature specified on the data sheets.
- 3.4.2 The SUPPLIER shall furnish a day tank for 12 hours autonomous operation along with associated fuel piping. The day tank shall have a valved drain, an adequately sized breather vent designed to exclude dust and water from the tank, and a tank capacity sight glass. The fuel system shall incorporate flexible fuel lines between the day tank and the engine to isolate vibration. The day tank shall have low and high level alarm switches to control the refilling. Tank shall also have secondary containment.
- 3.4.3 The fuel filter shall be located such that spilled fuel cannot fall on hot parts of the engine or generator. A cleanable primary fuel strainer shall be used to collect sediment between the tank and the main engine fuel filter. A fuel/water separator shall protect the system from water damage.

3.5 **Speed Governing**

- 3.5.1 The engine shall be equipped with Electro-Hydraulic Governor Actuator and a solid state Electronic Governor Control System complete with magnetic speed pickup for the load and speed.
- 3.5.2 In the event of over speed or emergency shutdown a device shall be provided which shuts off fuel, air, or both, to the Diesel engine.

3.6 **Cooling**

- 3.6.1 Each engine-generator unit shall be closed air circuit cooled or IC3A1 with filters at inlet of generator and also at the inlet of the canopy.
- 3.6.2 The engine cooling system shall be a water cooled, closed-circuit design. The system shall have sufficient capacity to maintain stable operating temperatures at maximum engine output and under the worst site conditions. The coolant pump shall be integral with the engine.
- 3.6.3 The engine-cooling fan shall be the blower type. The fan, fan drive, and fan belts shall be covered with 2.0 mm (minimum) steel mesh guarding, to protect personnel from injury.
- 3.6.4 Coolant for the engine cooling system shall comply with the specification requirements of the Diesel engine manufacturer.

3.7 **Lubrication**

- 3.7.1 The engine main lube oil pump shall be the positive-displacement gear-driven type that is integral with the engine, and shall be easily accessible for maintenance.
- 3.7.2 An oil cooler shall be provided to limit excessive lube oil temperatures.
- 3.7.3 Lube oil filters shall be located downstream from the lube oil coolers over a drip pan.
- 3.7.4 The Diesel generator set shall include an easily accessible provision for lube oil drainage at the edge of the base or rails.

3.8 **Generator Bearings**

- 3.8.1 Anti-friction bearings shall have no filling slots. Bearing racemetal temperature shall not exceed 90°C based on a maximum ambient temperature of 40°C.
- 3.8.2 Regreasable bearings shall be provided with two (2) NPT-tapped and-plugged holes, and fill-in and drainage plugs. The holes shall be provided with threaded Type 300 Series stainless steel plugs. Sealed anti-friction bearings shall be installed by SUPPLIER.

- 3.8.3 Bearings shall be serviceable without moving or disconnecting the generator. Inaccessible grease fittings shall be tubed to extend to the edge of the skid for ease of maintenance.
- 3.8.4 Sleeve-type bearings shall be equipped with split, labyrinth-type end seals and deflectors where the shaft passes through the housing. Lip-type seals shall not be used. The sleeve bearing shell metal temperature shall not exceed 90°C based on a maximum ambient temperature of 40°C.
- 3.8.5 Two-bearing generators shall have interchangeable bearings.
- 3.8.6 A two-bearing generator shall have one bearing electrically insulated from the generator frame or baseplate.

3.9 **Nameplates and Rotation Arrows**

- 3.9.1 Nameplates and rotation arrows shall be Type 316 stainless steel or Monel, securely fastened by pins of similar material. They shall be located such that the information can be read after the equipment is installed. Entries shall be marked by etching, engraving or other methods of permanent marking.
- 3.9.2 The following data is required on the generator nameplate, in addition to the requirements of IEC codes and standards and may be on a separate nameplate:
- Buyer's purchase order number
 - Manufacturer's location
 - Rotor weight
 - Manufacturer's order reference number
 - Insulation system designation
 - Generating voltage in KV
 - Generator current in amps
 - Design Power factor
 - KVA Rating

4.0 **ENGINE-GENERATOR CONTROL AND SWITCHGEAR**

4.1 **Control**

4.1.1 Generator Control Panels shall include, but not be limited to, the following equipment. Any additional equipment for the required operation and control shall also be supplied, as per requirement of Scope of Work document.

- a) Driver and generator temperature monitoring equipment
- b) Governor
- c) Automatic voltage regulator and reference adjuster
- d) Starting sequencer
- e) Exciter diode monitoring system
- f) Canned message display with first out annunciation
- g) Excitation limiter
- h) Overspeed switch
- i) Automatic generator loading control
- j) Synchronizing panel for parallel operation with other Gas generators.

Individual control switches for each circuit breaker capable of being controlled from the generator control panel.

4.1.2 The control panel shall consist of the following circuits:

1. Engine starting and control circuits
2. Metering, relaying and protection circuits
3. Alarm circuits
4. Space heater
5. Ready for loading signal (breaker closing signal)
6. Synchronizing scope, voltage and speed rise/lower manual handles

4.1.3 The control panel shall have following equipment for the manual synchronization with other power source.

1. Frequency meters, voltage meters and synchronizing check lamps for diesel engine generator bus and Normal supply bus with a synchronizing selector switch and a breaker closing switch
2. Synchronizing scope (the synchronizing check relay (25) will be provided by Purchaser in the switchgear)
3. Voltage Raise/Lower switch and Speed Raise/Lower switch.

4.1.4 The control panel shall contain, but not be limited to, the following readout devices:

- Voltmeter, 1.5% accuracy
- Ammeter, 1.5% accuracy
- Power Factor Meter, + 5% accuracy
- Frequency meter, + 5% accuracy
- Kilowatt meter with an auxiliary digital output for remote monitoring
- Engine tachometer
- System DC voltmeter
- Engine running hour meter
- Power meter

4.1.5 The control panel shall provide the following minimum annunciators containing open dry contacts for the following summary of seven (7) alarms/status and four (4) shutdowns listed below:

- Generator on load (status)
- Charger failure (alarm)
- Low battery voltage (alarm)
- Low fuel level (alarm)

- High coolant temperature (alarm)
- Low oil pressure (alarm)
- High coolant temperature (shutdown)
- Low oil pressure (shutdown)
- Overcrank (shutdown)
- Overspeed (shutdown)

Note: A proven standard supplier supply package with the approval of Company shall be considered as an alternative option.

- 4.1.6 Generator control panel shall be a free standing IP55 enclosure, completely factory assembled, wired, and tested. Panels shall require front access only.
- 4.1.7 Panels shall have removable lifting angles or eyes and a channel base suitable for rolling or skidding. Panels shall be supplied with an isolated instrument copper ground bus and an enclosure copper ground bus. The panel shall be suitable for field wiring to enter from either above or below. Removable gland plates shall be supplied for incoming metal clad field cable termination.
- 4.1.8 Fuses, switches, and other miscellaneous accessories shall be located inside the panel such that all equipment can be easily serviced and maintained.

4.2 **Generator Protection**

- 4.2.1 Generators shall be provided with sufficient devices to protect the unit as required by the Supplier and this specification. Following are the minimum requirements
 - Generator phase sequence
 - Over/Under voltage (27/59)
 - Over/Under frequency (81 O/U)
 - Reverse Power (kW) (32)

- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)
- Negative Phase Sequence Relay (46)
- Check Synchronizing Relay (25)
- Field Failure (loss of excitation) Relay (40)
- Machine thermal Relay (49)
- Earth Fault Relay (64)

4.3 **Wiring**

- 4.3.1 All wiring internal to the skid shall be provided and installed by Vendor. Except for the power leads of generator, all wires for circuits which continue external to the skid shall be brought to a terminal box at the edge of the skid.
- 4.3.2 The skid shall have two (2) earth terminals for 70 mm² earth wires. Earthing of motors and controls in the skid shall be made by vendor. The generator shall have its neutral brought out separately. The generator control and synchronizing panel shall have a copper earthing bus with provision for earthing on both sides with 70 mm² earth wire.
- 4.3.3 Wiring terminating on terminal blocks shall be identified both on the wiring and on the marking strips. All wires shall be permanently marked on both ends by means of wire sleeve markers. Adhesive wire labels are not acceptable.

5.0 **GENERATOR SET INSTALLATION**

5.1 **Enclosure**

The generator set shall be provided complete with acoustic canopy and shall be installed in an open shelter (no side-wall). The enclosure for the generator set shall be designed against windblown rain.

5.2 **Noise Control**

Company shall limit the noise level below 85 dBA at 1 m distance

6.0 **ACCESSORIES**

6.1 A complete set of accessories normally used for installation and commissioning of the specified equipment shall be furnished including:

6.1.1 Air intake system with air cleaner

6.1.2 Exhaust air duct and its supports

6.1.3 Fuel supply system with necessary piping and fittings

6.1.4 Exhaust gas silencer, piping/fitting and its anti-vibration supports

6.1.5 Automatic voltage regulator of solid-state design. It shall be located in the generator control panel.

6.1.6 Batteries and Battery Charger (Maintenance Free, Sealed Lead-acid storage batteries of the heavy-duty diesel starting type shall be provided)

7.0 **FINISH**

Finish of the specified equipment shall be made according to the manufacturer's proven standard (subject to purchaser's approval).

8.0 **TESTING AND INSPECTION**

8.1 **General**

Inspection and testing of the Diesel generator set shall be carried out as per International Standard.

8.2 **Testing**

8.2.1 **Performance Tests**

Performance tests are required for the generator set. Performance tests shall be conducted only after all pressures and temperatures have equalized. The tests shall be comprised of the following:

- 30 minutes running at 50% load
- 30 minutes running at 75% load
- 4 hours running at 100% load

- 15 minutes running at 110% load (overload) (not applicable to standby rated units)
- Cold start with load step check
- Full load rejection governor response

The following tolerances shall be applied for the full load test in the evaluation of the performance test results:

- Generator power shall be within 5% of rating specified.
- Fuel consumption shall be within 3% of that quoted by manufacturer

Note: A proven standard SUPPLIER supply package will be considered as an alternative option.

The Diesel generator set shall be fully equipped with all components and accessories. Operating conditions (such as barometric pressure, ambient temperature and humidity) and the fuel heat value shall be indicated on the performance certificates.

Within 15 calendar days of the final successful tests, the SUPPLIER must send to COMPANY one (1) original, eight (8) hard and three (3) soft copies of all material and test certificates.

The lubricating Oil, diesel and any other consumables shall be provided by the Contractor.

8.2.2 Additional Tests

The following additional tests are required for the Diesel Generator set:

- 8.2.2.1 Test engine over speed trip system
- 8.2.2.2 Test Diesel Generator set starting system to prove that consecutively at least five (5) starts can be made as specified.
- 8.2.2.3 Connect the remote generator control panel and verify operation of Diesel Generator set alarms, shutdowns and control functions.

8.3 **Reports and Acceptance Certificates**

Preliminary and final dossiers shall be prepared as described in the requisition document. Other relevant certificates shall also be provided together with equipment release note.

9.0 **PREPARATION FOR SHIPMENT**

9.1 Each unit shall be suitably prepared for the type and mode of shipment specified.

The preparation shall be suitable for up to 6 months of outdoor storage from the time of shipment in a manner requiring no disassembly prior to operation.

9.2 The Supplier shall provide the purchaser with the job site storage instructions for the generator sets.

9.3 Preparation for shipment shall be as specified in the following paragraphs as a minimum.

9.3.1 Exterior surfaces, except for machined surfaces, shall be primed and painted.

9.3.2 After having been thoroughly drained and cleaned, internal areas of bearings and all auxiliary equipment in oil lubrication systems using carbon steel shall be coated with suitable oil- soluble rust preventive.

9.3.3 Flanged openings shall be provided with metal closures at least 5 millimeters thick, with synthetic rubber gaskets. At least four full-diameter bolts shall be used for flanged openings.

9.3.4 The equipment shall be mounted on a rigid skid suitable for handling by forklift truck or crane.

9.3.5 The rotor of sleeve-bearing generators shall be blocked to prevent axial and radial movement.

9.3.6 Space heater leads shall be accessible without disturbing the shipping package. The leads shall be suitably tagged for easy identification.

9.3.7 Lifting points or lugs shall be clearly marked.

9.3.8 Open ends of tubes and pipes shall be capped. Taping is not adequate for protection.

- 9.3.9 Exhaust silencer openings shall be wrapped with plastic to prevent the entrance of rain.
 - 9.3.10 All doors shall be locked closed. Keys shall be securely attached to the skid. Duplicate keys shall be given to the Company during testing.
 - 9.3.11 Separate control panels shall be crated and wrapped with plastic to prevent the entrance of moisture. Shipment by water requires waterproofing.
 - 9.3.12 All field openings in generator skid or enclosure, such as those for bus duct, cable bus, or multi-cable transits, shall be filled for shipment using marine grade plywood.
- 9.4 The generator shall be properly identified with item number, serial number and any other information required by the purchase order. All material shipped in separate crates shall be suitably identified with securely affixed, corrosion resistant metal tags indicating the item and serial number of the equipment for which it is intended.

The fit-up and assembly of machine-mounted piping and other equipment shall be completed in the Supplier's shop before shipping.

10.0 **SPARE PARTS**

The Supplier shall provide separate recommended spare parts lists with prices for commissioning, start up, emergency and two (2) years operation. All spare parts shall be tagged as shown on the list of materials and shall be shipped at the same time as the main equipment.

11.0 **SITE ACCEPTANCE TEST (SAT) AND COMMISSIONING ASSISTANCE**

The SUPPLIER shall be responsible to undertake a SAT prior to the commissioning and pre-commissioning activities. Supplier's expert(s) will be responsible to pre-commissioning and commissioning of the equipment at the time of plant start up.



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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

SPECIFICATIONS FOR LOW VOLTAGE SWITCHGEAR



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1.0 **GENERAL**

1.1 **Introduction**

Oil & Gas Development Company Limited (OGDCL) is operating oil/gas fields in various parts of Islamic Republic of Pakistan. OGDCL intends to undertake Installation of, Compressors, Slug Catcher and related utilities in one of the fields, MELA. MELA is located in KPK Province of Islamic Republic of Pakistan.

1.2 **Purpose**

This specification covers the minimum requirements for the design, manufacture, testing and supply of low voltage switchgear and MCC.

The switchgear and control gear assemblies shall be complete in all respects as defined in this specification, data sheet and single line diagrams.

The VENDOR shall offer standard equipment to perform the duty stated in this specification. Any variation of the VENDOR'S standard package from this specification must be stated by the VENDOR.

Protection and packing of all material shall be supplied suitable for both shipment and protection on job site during long storage periods prior to installation.

Equipment manufacturing record books, equipment record (data) books and operating and maintenance manuals are required.

1.3 **Definitions**

COMPANY: Oil & Gas Development Company Ltd.
(OGDCL)

CONTRACTOR: Means the EPCC Contractor or the Construction Company to be engaged by the COMPANY to perform the Engineering, Procurement, Construction, Commissioning and performance testing of the plant.

VENDOR / SUPPLIER: The organization, firm or agency with whom order for the supply of equipment and or material has been placed.

2.0 **CODES AND STANDARDS**

2.1 **Codes, Standards and Regulations**

The following codes and standards, to the extent specified herein, form a part of this specification. When an edition date is not indicated for a code or standard, the latest edition in force at the time of VENDORS proposal submitted shall apply. Perform the work in accordance with the relevant codes and standards from the regulatory agencies and institutes listed below. The latest issue of an individual code, standard or regulation at the time of contract signing governs:

IEC 60050	Chapter 441: Switchgear, control gear and fuses
IEC 60051	Direct acting indicating analogue electrical-measuring instruments and their accessories
IEC 60079	Electrical apparatus for explosive gas atmospheres
IEC 60112	Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions
IEC 60185	Current transformers
IEC 60186	Voltage transformers
IEC 60255	Electric relays.
IEC 60269	Low voltage fuses
IEC 60439	Low-voltage switchgear and control gear assemblies
IEC 60445	Identification of equipment terminals and terminations of certain designated conductors, including general rules for an alphanumeric system
IEC 60521	Class 0.5, 1 and 2 alternating-current watt-hour meters
IEC 60529	Degree of protection provided by enclosures. (IP Code)
IEC 60617	Graphical symbols for Electrical diagrams

IEC 60664	Insulation coordination for equipment within low-voltage systems, including clearances and creepage distances for equipment. IEC 60688 Electrical measuring transducers for converting AC electrical quantities to analogue or digital signals
IEC 60688	Electrical measuring transducers for converting AC electrical quantities to analogue or digital signals
IEC 60947	Low-voltage switchgear and control gear
BS EN 61439-4	Low-voltage switchgear and control gear assemblies
BS EN 60947-4-2	Low-voltage switchgear and control gear. Contactors and motor-starters
BS 4752-1	Circuit Breaker
BS 88	HRC Fuses
BS 89 & 90	Ammeters and Voltmeters

2.2 **Language and Measurement System**

Language used for all documentation, name plate data, tagging etc., shall be English.

For mentioning units of measurement, SI units shall be followed including mention of equivalent F.P.S units in parenthesis adjacent to the SI units.

3.0 **DOCUMENT PRECEDENCE**

It shall be the VENDOR'S responsibility to be, or to become, knowledgeable of the requirements of the referenced Codes and Standards.

The VENDOR shall notify the CONTRACTOR of any apparent conflict between this specification, the related data sheets, the Codes and Standards and any other specification noted herein. Resolution and or interpretation precedence shall be obtained from the CONTRACTOR in writing before proceeding with the design manufacture.

4.0 **SPECIFICATION DEVIATION/CONCESSION CONTROL**

Deviations from this specification are only acceptable where the VENDOR has listed in his quotation the requirements he cannot, or does not wish to comply with, and the COMPANY has accepted in writing the deviations before the order is placed.

In the absence of a list of deviations, it will be assumed that the VENDOR complies fully with this specification.

5.0 **ABBREVIATION**

ASME	-	American Society of Mechanical Engineers
BS	-	British Standards
CT	-	Current Transformer
DC	-	Direct Current
HBC	-	High Breaking Capacity
IP	-	Ingress Protection
IEC	-	International Electro technical Commission
LCS	-	Local Control Stations
LED	-	Light Emitting Diode
MCC	-	Motor Control Centers
NEQS	-	National Environment Quality Standard
PVC	-	Poly Vinyl Chloride
RTD	-	Resistance Temperature Detectors
SLD	-	Single Line Diagram
VT	-	Voltage Transformer.

6.0 DESIGN / MATERIAL / MANUFACTURE

6.1 Electrical Characteristics of Assemblies

6.1.1 MCC Type

Switchgear and control gear shall be of the compartmentalized metal enclosed type and shall be designed to minimize any risk of developing a short circuit or propagating a short circuit.

6.1.2 Rated Voltages

The assembly shall be suitable to form part of a system with coordinated insulation values in accordance with IEC 60664 -1, over voltage category IV, and shall be type tested accordingly. Assembly shall be specified to operate continuously at 90% to 105% of system voltage coincident with 98% to + 102% of system frequency. Voltage depressions to 80% of system voltage at equipment terminals during motor starting shall have no detrimental effect on equipment operation. Overvoltages of up to 120% of system voltage at equipment terminals as a result of AVR action shall have no detrimental effect on equipment operation.

Electrical Supply Systems will be as follows:

Main

- 400 V, 3-phase, 50 Hz, As per SLD
- Short circuit rating, As per SLD

Auxiliary

- For Contactor: 230 V, 1-phase, 50 Hz
- Anti-condensation Heater: 230 V, 1-phase, 50 Hz

6.1.3 Rated Current

The main bus bars shall be rated for the nominal current over the entire length of the assembly and shall not be rated lower than the incoming and sectionalize units. The current rating shall be as shown in the single line diagrams.

6.2 **Particular Definitions**

6.2.1 **Panel**

A constructional unit of a (multi)-cubicle type assembly between two successive vertical delineations.

6.2.2 **Section**

A constructional unit consisting of a number of panels connected to a continuous bus bar system.

6.2.3 **Sectionalizing Unit**

A mechanical switching device to connect the bus bars of two sections.

6.3 **Mechanical Design**

6.3.1 **General**

Switchgear and MCC shall be of the compartmented metal enclosed with internal separation of Form 4 type per IEC 60439-1, fully draw out designed to minimize any risk of developing a short circuit or the propagation of a short circuit and to ensure personnel and operational safety during all operating conditions, inspections, maintenance, the connection of main control and auxiliary cables and the equipping and commissioning of spare panels while the switchgear/MCC is live and in operation.

Enclosures shall comply with IEC 60439 for their mechanical strength in the event of an internal arc.

Isolating mechanisms and unit withdrawal facilities shall be suitable for operation by a single operator and designed for minimum effort and time of operation.

The structures, including doors and panels shall be capable of withstanding the internal pressures created by faults within the structures equal to the maximum fault current rating of the main circuit breaker without danger to operating personnel. Switchboards MCC shall be extendable at both ends.

The switchboards shall be metal enclosed to Form 4 of IEC 60439, free standing, vermin proof and of the dead front type and shall be suitable for floor fixing by bolts or tack welding.

The cubicles shall be partitioned internally to form individual metal enclosed compartments for the circuit breakers, bus bar, current and voltage transformers, instruments, relays, secondary terminals and cable connections.

The individual compartments and the cubicles which form a composite switchboard shall be so designed as to prevent the spread of flame and ionized gas between compartments.

Width of the cable alleys provided shall be adequate to accommodate and permit installation and inspection of oversized cables necessary due to the site environmental conditions. Minimum width of cable alley shall be based on the number and size of cables entering the panel.

All structural work shall be adequately protected against corrosion. Final outside finish color shall be light gray (RAL 7035).

All outgoing cable entries should be from the cable chamber attached to the side of each cubicle in LV Switchgear/MCC.

These cables should be terminated on insulated terminal block. Any of this terminal blocks should not be exposed while connecting any new cable to the system. Switchgear and control panels shall have bottom entry for external/field cables and top entry for internal switch room cables.

6.3.2 Terminals for Copper Conductors

Main power circuit cable should be terminated with the use of compression type cable lugs bolted to the connectors of the switchgears/MCC. Safety protection shroud should be provided on live portion of cable terminations, within the assemblies which have to be accessible during normal operation or maintenance. Adequate space shall be provided to the main cabling to have facility for measuring the current of each phase with help of portable clamp on meter.

In view of the substantial cable de-rating that is normally applied, adequate terminals and cable termination space shall be provided for the main cabling.

For bus wiring and outgoing control circuits, individual terminals shall be provided for each external conductor. These terminals shall be of the no loosening, wedge type or cage type construction, obviating the use of cable lugs. They shall be constructed in such a way that direct contact between screw, bolt or nut and conductor is avoided.

Terminals shall be identified in accordance with the related wiring diagram. The layout shall be consistent and logical. Unless otherwise specified, terminal arrangement for the control of motors shall be standardized.

As a standard, assemblies shall have facilities for the entry of cables from below. Cable entries, support facilities for cable clamping, and earthing facilities shall be provided suitable for the type, size and number of cables as specified.

All the cable shall be terminated using the glands, the size of gland plate shall be selected in accordance to the total number of cables entering the compartment. Cable entry shall not affect the IP rating of the panel.

Gland plates and glands for single core cables shall be of non-magnetic material.

6.3.3 Secondary Wiring and Terminals

Test block(s) terminals for injection testing of relays and measuring devices shall be provided on all circuits fitted with circuit breakers.

Secondary wiring shall be PVC insulated 600/1000 V grade, stranded copper conductors, and minimum size 2.5 mm². The internal chassis control wiring to the MM III protective relays shall be a minimum of 1.0 mm² in size.

All wires used inside the starter cubicles shall be flame retardant type.

Secondary wiring within the switchgear shall be securely held in position (either loomed or run in conduit / trunking). Where wiring enters or passes through compartments containing bus bar then it shall be run in earthen metallic conduit / trunking.

Secondary wiring layout shall permit alterations to individual circuits without requiring shutdown of the complete switchgear. Bus wires for closing, tripping, control, indication, heaters, etc., shall be run within the switchgear.

Each individual branch circuit from an auxiliary bus wiring system shall be provided with a selectively graded protective device.

Wiring identification shall be by barrel type numbered and/or lettered ferrules, of insulating material adjacent to the terminals.

Flexible cables shall be used for connections on door mounted equipment. Wiring shall be loomed, wrapped in flexible PVC conduit and be firmly clamped at both ends to prevent movement at terminations.

All wiring for external connections shall be brought out to individual terminals on a readily accessible terminal block.

6.4 **Enclosure and Degree of Protection**

Switchgear assemblies shall be completely enclosed, self-supporting and suitable for floor mounting, in multi-cubicle or multi-box type structures.

Cover bolts or nuts shall be retained in place when undone (captive bolts and nuts).

Any insulation material used shall have flame retardant properties. The degree of protection as per IEC 60529 for any assembly shall be:

- For indoor use (in enclosed buildings) IP42

Anti-condensation heaters shall be supplied with ON/OFF switch and thermostat.

6.5 **Temperature Rise**

The temperature rise limits as given in Table 2 of IEC 60439 shall not be exceeded when the assembly is fully loaded.

6.6 **Protection against Electric Shock**

All switchgear components requiring maintenance shall be easily accessible. All components in wall or back-to-back mounted switchgear (if applicable) shall be accessible from the front only.

Exposed parts within the assemblies which have to be accessible during normal operation, maintenance or equipping of spare compartments, shall either not be alive in the opened position or shall be protected to a degree of protection of at least IP 20.

NOTE: It must be realized that the terminals of the incoming and sectionalizer switching devices can be alive when the device is in the OFF position. Consequently these terminals shall always be protected to a degree of at least IP 20.

HBC fuses and associated fuse carriers shall only be accessible when they are fully isolated or when they offer a degree of protection to live parts of at least IP 20 when the fuses are inserted, withdrawn or during withdrawal.

Terminals of equipment installed on a compartment door and which can be alive when the door is opened shall be shrouded to a degree of protection of at least IP 20.

Compartment doors or covers shall be interlocked to prevent opening when the isolating switch is in the 'ON' position. The isolating device shall only be operable when the door is fully closed and when the withdraw able unit is in the fully inserted position.

When a withdraw-able unit has been removed from the assembly, the live parts inside the fixed compartment shall be protected against touch, with a degree of protection of at least IP 20. Where shutters are fitted to comply with above requirement, they shall be mechanically operated by the movement of the withdraw able unit and not be dependent on gravity. Each set of shutters shall be capable of being individually operated and pad lockable in the closed position.

If a test position is provided (partly withdrawn unit), the degree of protection shall be at least IP 20.

Interlock systems shall be of a mechanical lever type and shall not rely on the operation of springs or gravity.

All practicable measures shall be taken to prevent danger to personnel working on a disconnected functional unit with adjacent units still in operation. Parts likely to be removed for maintenance shall have retainable fastening means.

The shutters made of insulation material should be provided in the withdraw able type cubicles.

6.7 **Short Circuit Protection & Short Circuit withstand Strength**

6.7.1 General

In the event of an internal fault in a functional unit, the damage shall be confined to that unit, so that the bus bar system and all other functional units remain fit for further service Likewise, an internal fault in a dropper system shall be confined to the associated panel, so that the bus bar system and the other panels of the assembly remain fit for further service.

6.7.2 Relationship between Peak and R.M.S Short Circuit Current

The values of the factor 'n', giving the relation between peak and r.m.s. value of the short circuit current shall be as stated in table 5 of IEC 60439.

6.7.3 Coordination of Short circuit Protective Devices

In motor starter units, the coordination between starter and protective device shall comply with type “2” as specified in IEC 60947-4-1. This generally implies that a starter is sufficiently protected by the short circuit protection that no damage will occur to the starter in case of a through-going fault current.

Type test reports shall be made available on request.

6.7.4 Circuits within an Assembly

The bus bar system which under the terms of this specification includes all live conducting parts from the incoming terminals of the assembly up to the circuit protection inside the single outgoing functional units shall be considered as being a ‘fault free zone’. The arrangements shall be such that a fault in this zone shall be virtually impossible under all conditions.

The short circuit protection device inside each outgoing functional unit shall be connected directly to the bus bars without the use of any cables.

6.8 Switching Devices and Components Installed in Assemblies

6.8.1 Selection of Switching Devices and Components

All components shall be standardized as far as practical.

The connections of the auxiliary circuits of withdraw able units shall be of the plug- and-socket type, automatically operated by the unit.

Circuits, components, wiring and terminal arrangements shall be standardized as far as practicable.

All protective relays on circuits equipped with Air circuit breakers shall be of the microprocessor type with built-in diagnostics.

6.8.2 Bus Bar System

The phase, neutral and earth bus bars shall be of hard or medium hard drawn, high conductivity copper

The phase and neutral bus bars should be located in the top compartments of the switchboard.

The primary bus shall be tin coated and will be air insulated.

The bus bar system shall be accessible for construction and maintenance duties. In case of a bus bar short circuit, it shall be possible to clean or to replace the bus bars and the support system without stripping the assembly.

All Bus bars, copper flexible including Bus bar joints shall be properly plated or tinned to prevent oxidation due to corrosion.

Vertical sections of Bus bar shall be fully rated for particular cubicles.

The earth bar shall be located in the top or bottom compartments and in all cable riser compartments of the switchboards and shall be easily accessible. Sufficient connection points with adequate terminating facilities shall be provided for terminating the cable earth leads.

Bus bars shall be air insulated with at least the minimum clearances in air as per applicable standards for a 500V, 3 phase system.

Bus bars shall be color coded red, yellow and blue for phase and black for neutral. Terminals, however, may be marked with the letters, R, Y, B and N.

Bus bars shall be of the same cross-sectional area throughout the length of the switchboards.

Barriers shall be provided, where applicable, to prevent arcs occurring in incoming bus ducts or from cable terminations flashing to the main bus bars.

Where bus section breakers are specified, they shall be so arranged that one complete section of bus bar and associated connections can be isolated and made safe to work on while an adjoining section of bus bar is still energized.

6.8.3 Incoming and Sectionalizing Units

Incoming and sectionalizing units shall be mounted in separate panels and shall be provided with independent withdraw able air-break type circuit breakers. The utilization category for the manually operated switches as per IEC 60947-3 shall be at least AC 2 for switching devices up to and including 630 A and may be AC 21 for devices with higher current ratings. The utilization category for circuit breakers as per IEC 60947-2 shall be category A, unless otherwise specified.

The circuit breaker shall be fitted with manual and motor spring charging mechanism for closing.

Switching devices shall switch all phases or poles (i.e. 4-pole type for 3 phase + neutral systems). For balanced systems the neutral pole current rating shall not be less than as specified for the neutral bus bars.

The switching devices shall have padlock facilities in the 'OFF' position. Key interlock systems between incoming and sectionalizer units shall only be provided when specified.

Each incoming unit shall be provided with metering and protection as shown in single line diagrams.

The metering supply to Volt and Watt-hour meters etc. shall be protected with HBC type fuses of the fully insulated pattern fixed directly to the bus bar system. A second set of fuses or miniature circuit breakers discriminating with the HBC-type fuses shall be mounted local to the instrument(s).

Circuit breakers shall be of the withdraw able air-break type with an isolated test position. Guides shall be provided to ensure correct alignment when engaging or withdrawing the circuit breaker.

Circuit breaker tripping shall be by shunt trip release. A manual trip push-button and trip indicator shall also be included.

All circuit breakers shall be fitted with a hand reset, high speed-tripping relay interlocked to prevent the circuit breaker closing until the tripping relay is reset.

Under-voltage trip coil shall be provided for each Air circuit breaker.

Incoming and sectionalizer circuit breaker protective relays shall be solid state type microprocessor based with built in diagnostics facility, mounted in a modular, flush front, draw out case.

Each Protective Relay shall have a test provision for testing and calibrating the Relay using external power service without the need to disconnect the permanent wiring.

Several protective functions may be incorporated into a single Relay casing.

Facilities shall be provided for testing the circuit breaker closing and tripping mechanism when the circuit breaker is open and isolated in test position.

When a circuit breaker cubicle door is open and the circuit breaker is withdrawn, the compartment interior, including accessible terminals, shall be de-energized. Any terminals or components which, of necessity, are required to remain energized shall be sealed off or shrouded. In addition, warning labels shall be fitted adjacent to these terminals.

Any external power supplies which enter a conductor or a circuit breaker compartment shall be switched via auxiliary switches included on the isolator or circuit breaker to ensure that when the isolator or circuit breaker is open, all components in the compartment are de-energized.

All circuit breaker closing control circuits shall be provided with an anti-pumping device.

All doors providing easy access to control circuitry, the rear of instruments and to relays shall have padlocking or locking facilities.

All circuit breakers shall be electrically operated but shall also be fitted with an independent mechanical manual actuating mechanism. The actual operation of the manual closing mechanism shall be independent of the force applied by the operator. Partial operation of the circuit breaker shall not be possible.

All switching devices shall open automatically, be trip free and have their energy for the opening operation stored prior to the completion of the closing operation. They shall also be provided with a local manually operated tripping feature protected against inadvertent tripping. This operation shall be mechanical.

All electrical charging and electromagnetic mechanisms as well as the closing control components shall be capable of operating when the auxiliary closing or control supply is at the extremes of tolerance limits stated in the data sheets and specifications

All circuit breakers will be fitted with a trip circuit supervision relay to supervise continuously the tripping supplies, coils and circuit wiring, and to provide a no trip power/no close interlock.

Circuit breakers shall have sufficient normally open contact and normally closed contact auxiliary switches for interlocking and intertripping purposes, including all requirements on the one line diagram.

AC auxiliary supplies, together with interlocking, grouped common alarm etc., shall be fully bus wired within the switchboard, including spare and empty compartments.

Key interlocking shall be provided on incoming; outgoing and sectionalize units as required by the Requisition associated one line diagram(s), and/or protection diagrams.

6.8.4 Switches (Mechanical)

Switches shall be of the independent manual operating, air-break type with quick snap action make and break features.

Switches shall be easily accessible and operable from the front of the switchboard without opening a cover.

Switching devices shall be of the 3-pole type for 3 phase + neutral systems and 2- pole for single-phase circuits. In motor circuits 3 pole switches shall be used with the neutral switched by auxiliary contact of the switch.

The neutral pole of a switching device in balanced 3 phase + neutral systems shall have a current rating equal to that of the other poles up to and including 63 A and, if above 63 A, 50% to that of the other poles with a minimum of 63 A.

Switches shall have a rated (conditional) short circuit making capacity in conformity with the prospective short circuit currents, as specified for the bus bar system.

All switches used for isolating a circuit shall be pad lockable in the 'OFF' position.

6.8.5 Circuit Breakers

Circuit breakers shall comply with the requirements as specified for switches as far as operating accessibility, padlocking and phase and neutral switching is concerned.

Circuit breakers shall comply with and be type tested to IEC 60941-2 and shall have utilization category A, except for circuit breakers feeding sub-distribution switchboards which shall have utilization category B. Circuit breakers shall have a rated short circuit making and breaking capacity in conformity with the prospective short circuit current as specified in the Requisition. All circuit breakers shall be withdrawable type unless specified otherwise.

Robust switches should be provided to indicate the position of breaker. Following position switches should be provided as a minimum,

- Breaker in service position (this switch should only be activated once the contacts of breaker are physically engaged into the contacts of the bus)
- Breaker in full racked out condition
- Breaker in test position

6.8.6 Fuses

High breaking capacity (HBC) type general purpose fuse links, utilization category 0 in accordance IEC 60269-1 shall be used. The breaking capacity shall be equal to the short circuit rating of the bus bar system.

6.8.7 Motor Starters and Contactors

All motors above 125 HP shall be fitted with anti-condensation heaters and preferably with soft starter/VFD.

As a standard, contactors shall be of the holding coil type suitable for control supply.

With reference to IEC 60947-4-1, motor starters and contactors shall conform to the requirements of both uninterrupted duty and intermittent duty class 12 (12 operating cycles per hour), at rated operational current. They shall have a mechanical durability level of one million no-load operating cycles.

For special loads such as capacitors, lighting, etc. a suitable current rating and utilization category shall be selected by the **VENDOR**.

ON/OFF position indication of contactors shall be fitted on the front of the compartment by clear red light for 'ON' and clear green light for 'OFF'. The indication lights shall be of the long life, low power consumption type, e.g. multi segment LED or neon. Local contactor closing facilities shall not be provided on the assembly for motor starter units. In addition to the required number of auxiliary contacts needed for the control and indication circuits, each contactor and motor starter shall be provided with at least one make and one break contact element double gap, potential free, and wired up to the auxiliary terminal block of the compartment.

The motor circuits shall include one Amp meter on each of the cubicle. Contactors and starter units (except VFD) shall be of the fully withdraw able type and with three position; Rack-in, Test, Draw out.

Contactors and starter control circuits shall include a panel-mounted STOP button.

The STOP buttons shall have red operators of the "stay-put" type fitted with mushroom heads and shall be labeled "STOP". Guards shall be fitted to prevent inadvertent operation.

Starters shall be equipped with an amber neon lamp to indicate when the motor has "tripped" on overload or earth fault.

All motor circuits shall be provided with Local Control Station (LCS), which will be located near the motor in field. Local control station/on-off switch for motors will be explosion proof as per hazardous area classification. LCS shall have following features;

Mode Selector switches, a three position mode selector switch shall be installed on the LCS with Hand -Off- Auto positions. When at Hand position motor can only be started from LCS. When on Auto the motor shall be controlled from the DCS (Either manual or automatic).

- Control stations shall be equipped with a "stay put stop" facility, which can be padlocked in the "stop" position.
- ON/OFF indications (Red for motor running and green for motor stop)

As the load shedding system will be installed. Each starter shall be equipped with necessary provision/interference with the load shedding system. In case of activation of the load shedding, all selected Motors shall be shut down through the provided interference/interlock.

6.8.8 Motor Protection Relays

Thermal overload relays shall be of the electronic type. They shall be provided with temperature compensation and single phasing protection. The motor starter coordination shall be type "2" according to IEC 60947-4-1.

Under voltage relays shall be provided for incoming mains.

Current transformers shall be provided with a removable short circuit link. The secondary side shall be 5 A for incomers and outgoing feeders and 1A or 5A for motor starters.

Motor Stalled and Phase Current Imbalanced protection will be considered for motors. Earth fault relays shall be of adjustable sensitivity type.

For motors with operating conditions beyond those covered by overload relays, special protection systems may be considered, e.g. installation of thermostat temperature sensors in the motor windings with its relay installed in the switchgear compartment. Agreement shall be reached with the PURCHASER in the quotation stage.

6.8.9 Current Transformers

Current transformers shall be in accordance with IEC 60185. Current transformers for measuring purposes shall be of accuracy class 3 (accuracy class 1 for measuring supplies from or to third parties) with an instrument security factor such that the instruments are not endangered at maximum fault current! The secondary current rating shall be 1A unless specified otherwise.

Preferred primary ratings of instrument current transformers for remote ammeters are:

10 A	30 A	75 A	150 A	300 A	500 A
20 A	50 A	100 A	200 A	400 A	

Protective current transformers shall be of accuracy class SP. The short circuit rating shall be at least 1 second if applied for short circuit protection. The wiring of the secondary circuits' shall have a cross section of at least 2.5 mm² (except those that cannot be wired on relays).

NOTE: CT's for motor overload relays shall be as specified by the relay VENDOR.

Secondary circuits of all current transformers shall be earthed. The specification of current transformers given above is to be considered a minimum requirement and does not relieve the VENDOR of the responsibility to specify and supply current transformers fully meeting the requirements of protection and measurement circuits.

Note: Separate CTs to be used for each of function i.e. Protection & Measurement.

6.8.10 Voltage Transformers

If voltage transformers are required, they shall be in accordance with IEC 60186 and shall be of class 3 (class I for measuring supplies from or to third parties).

The secondary voltage of metering transformers shall be 230V.

Secondary circuits of voltage transformers shall be earthed.

The specification of voltage transformers given above is to be considered a minimum requirement and does not relieve the VENDOR of the responsibility to specify and supply voltage transformers fully meeting the requirements of protection and measurement circuits.

6.8.11 Measuring Instruments

All meters should be of the square pattern type, and mounted at a suitable height for easy reading from the front. Scales shall be in actual values. Ammeters on motor starter and outgoing feeder modules may be of smaller dimensions.

Ammeters and voltmeters shall be accuracy class 1.5. Watt-hour meters or maximum demand meters shall be accuracy class 2.5 (accuracy class I for measuring supplies from or to third parties). See IEC 60051 and IEC 60521.

Ammeters for motor duty (if required) shall have a compressed overload scale and shall be suitable to withstand the motor starting currents.

The arrangement of the feeders shall ensure that operating handle of the switch/ breaker shall be ≥ 300 mm but ≤ 1800 mm from finished floor level.

6.8.12 Cooling

For switchgear and control assemblies only air natural cooling shall be applied.

6.9 **Name, Identification, Instruction & Warning Plates**

Nameplates including circuit labels, instruction and warning plates and caution notes shall be made of durable, corrosion resistant material. 3 Ply (white black white) traffolyte. These shall be fixed by self-tapping screws or pop rivets. Glued plates are not acceptable.

6.9.1 General Equipment Nameplate

The following information shall be given on the general equipment nameplate, which shall be mounted on the front of the assembly, e.g. on the sectionalizer or incoming feeder:

- VENDOR's name or trade mark
- Purchase order number
- Purchase order number
- Year of manufacture
- Rated voltage
- Rated frequency
- Rated current of bus bar system
- Rated voltage of auxiliary circuits (if applicable)
- Rated peak and short time withstand current and withstand time
- Degree of protection

The above information together with the other information of IEC 60439-I clause 5.1 shall be given in the relevant documents of the VENDOR.

6.9.2 Warning Plates, Caution Notices

In locations where dangerous situations may inadvertently be created, warning plate(s) or caution notice(s) shall be installed, identifying the danger point(s). This may be either in a compartment or on the outside of an assembly.

6.10 Inspection and Testing

Before switchgear assembly leaves the works, the VENDOR shall carry out the routine tests in accordance with IEC 60439-1 on the total assembly or parts thereof when delivered with time intervals and the results shall be recorded in a test report.

All equipment including SUBVENDORS equipment shall be subject to inspection and witness of tests at the VENDOR'S works by the CONTRACTOR or his appointed representative. The VENDOR shall provide a minimum of ten working days notice of inspection and test dates.

Compliance with the requirements of this specification, the Requisition and associated documents shall also be demonstrated. The equipment shall not be dispatched by the VENDOR until material and equipment test certificates have been approved by the CONTRACTOR at the time of the shop test acceptance.

Inspection and tests shall be carried out on the complete assembled switchgear.

The following minimum checks and tests shall be carried out:

Switchgear shall be visually inspected for technical execution and conformity with the latest issue of the approved drawings and with the Requisition. Spot checks shall be made to verify:

- The degree of protection of the enclosure
- The degree of protection within the compartments
- The effectiveness and reliability of safety shutters, partitions and shrouds
- The effectiveness and reliability of operating mechanisms, locks and interlock systems
- The insulation of the bus bar system
- The creepage distances and clearance

- The proper mounting of components
- The internal wiring and cabling system
- The correct wiring of main and auxiliary circuits
- The suitability of clamping, Earthing and terminating arrangements
- The correct labeling of functional nameplate
- The availability of the Earthing system throughout the switchgear
- The interchangeability of electrically identical components

All insulation resistance tests shall be performed between each phase and neutral against earth, with the remaining phase and neutral connected to earth.

A dielectric test shall be carried out in accordance IEC 60439-1, but for 1 minute.

Mechanical and electrical operational shall be carried out on all circuit breakers (powers, control and protective devices) and on at least 10% of motor/feeder functional units. Tests on protective circuits / devices shall include primary and secondary injection tests.

7.0 **QUALITY ASSURANCE / QUALITY CONTROL**

The VENDOR shall have in effect at all times, a QA/QC program which clearly establishes the authority and responsibility of those responsible for the quality system. Persons performing quality functions shall have sufficient and well-defined authority to enforce quality requirements that initiate, identify, recommend and provide solutions to quality problems and verify the effectiveness of the corrective action.

8.0 **DOCUMENTATION**

VENDOR shall submit the type and quantity of drawings and documentation for CONTRACTOR'S authorization or information as listed in the individual Material Requisitions and Purchase Orders.

Mutual agreement on scheduled submittal of drawings and engineering data shall be an integral part of any formal Purchase Order.

Comments made by CONTRACTOR on drawing submittal shall not relieve VENDOR or SUBVENDORS of any responsibility in meeting the requirements of the specifications. Such comments shall not be construed as permission to deviate from requirements of the Purchase Order unless specific and mutual agreement is reached and confirmed in writing.

Each drawing shall be provided with a title block in the bottom right-hand corner incorporating the following information:

- Official trade name of the VENDOR
- VENDOR'S drawing number
- Drawing title giving the description of contents whereby the drawing can be identified
- A symbol or letter indicating the latest issue or revision
- P.O. number and item tag numbers

Revisions to drawing shall be identified with symbols adjacent to the alterations, a brief description in tabular form of each revision shall be given, and if applicable, the authority and date of the revision shall be listed. The term "Latest Revision" shall not be used.

Unless otherwise stated in the Purchase Order, the VENDOR shall at least supply the following documents. The language used shall be English with the tender:

- Preliminary general arrangement and floor plan drawings
- Minimum clearances around the assemblies for ventilation and safety during operation and maintenance

After placement of order

- Single-line diagram and control schematic drawing showing protection & metering
- Wiring drawings
- Final assembly arrangement drawing showing main circuits, main dimensions, floor plan and shipping sections
- Minimum clearances around the assemblies for ventilation and safety during operation and maintenance
- Total mass of the assembly and of the individual shipping sections
- Transport, installation, commissioning, operation and maintenance instructions, limited and specific to the assembly and its components
- List of spare parts (commissioning & two years operations)
- List of applicable Type test certificates

- Test report of the Final Routine testing
- Details and characteristics of Protective Relays

9.0 **HANDLING**

9.1 **Packaging and Shipping**

Preparation for shipment shall be in accordance with the VENDOR'S standards and as noted herein. VENDOR shall be solely responsible for the adequacy of the preparation for shipment provisions with respect to materials and application, and to provide equipment at the destination in ex-works condition when handled by commercial carriers.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite.

Preparation for shipment and packing will be subject to inspection and rejection by COMPANY'S/CONTRACTOR'S inspectors. All costs occasioned by such rejection shall be to the account of the VENDOR.

After inspection and test, equipment shall be completely free of water and dry before start of preparation for shipment.

Equipment shall be packed, securely anchored, and skid mounted when required. Bracing, supports, and rigging connections shall be provided to prevent damage during transit, lifting, or unloading. All temporary bracing/supports shall be marked "REMOVE BEFORE EQUIPMENT COMMISSIONING AND STARTUP".

Separate, loose, and spare parts shall be completely boxed. Pieces of equipment and spare parts shall be identified by item number and service and marked with CONTRACTOR'S order number, tag number, and weight, both inside and outside of each individual package or container. A bill of material shall be enclosed in each package or container of parts.

Exposed finished and machined surfaces, including bolting, shall be given a coating of rust inhibiting compound. Internal metal surfaces shall be sprayed or coated with a suitable rust preventative prior to shipment. Openings shall be suitably tagged to indicate the rust preventative applied.

One complete set of the installation, operation, and maintenance instructions shall be packed in the boxes or crates with equipment. This is in addition to the number called for in the Purchase Order.

9.2 **Preservation and Storage**

Equipment and materials shall be protected to withstand ocean transit and extended period of storage at the jobsite for a minimum period of 18 months. Equipment shall be protected to safeguard against all adverse environments, such as: humidity, moisture, rain, dust, dirt, sand, mud, salt air, salt spray, and seawater.

Assemblies supplied in transport units shall have these units clearly marked to facilitate assembly at site.

Instructions for transport, storage, erection and maintenance of the equipment shall be supplied by the VENDOR as an integral part of the order

Special tools and equipment required for erection, commission, and maintenance shall from part of the order and shall be shipped together with the assembly.

10.0 **GUARANTEES AND PERFORMANCE**

The VENDOR shall guarantee, in accordance with general conditions, that the equipment shall meet the performance conditions specified in this specification and the data sheet.

GENERAL SPECIFICATION



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OIL & GAS DEVELOPMENT COMPANY LTD.

MELA DEVELOPMENT PROJECT

SPECIFICATION FOR SITE ENVIRONMENTAL CONDITIONS



Rev.	Date	Description	Prepared By	Checked By	Approved By
1	26-03-2018	Re-Issued for Tender	MAS	MIAH	SH
0	15-06-2016	Issued for Tender	FUH	YSK	SH

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1.0 **ENVIRONMENTAL DESIGN CRITERIA**

1.1 **Scope**

This specification covers minimum, site environmental data.

1.2 **Site Environmental Data**

The following table gives the site and environmental conditions applicable to the location and specific to design and sizing of equipment:

Description	Data	Unit
Ambient Temperature (min.)	30	°F
Ambient Temperature (max.)	112	°F
Average Monthly rainfall	0 to 50	mm
Maximum wind velocity	100	Miles / hr
Seismic zone (Earthquake Forces)	Zone 2B	
Average Peak Ground Acceleration	0.2	
Altitude reference (Elevation)	1900	ft
Relative Humidity	27% – 61%	