



**GUYANA POWER & LIGHT INC.
PROCUREMENT OF WORKS**

FOR

**CONSTRUCTION OF 25 MW \pm 5% HFO
FIRED POWER GENERATION PLANT**

GPL-PD-063-2022

**GUYANA POWER & LIGHT INC (GPL) 257 -259 MIDDLE
STREET SOUTH CUMMINGSBURG, GEORGETOWN,
GUYANA**

MAJOR PROJECTS DEPARTMENT

OCTOBER 2022

Closing Date: November 24, 2022 @ 14:00 hrs.

Bid Opening: November 24, 2022 @ 14:30 hrs.

Invitation for Bids (IFB)

Co-operative Republic of Guyana

IFB# GPL-PD-063-2022

The Guyana Power and Light Incorporated (GPL) invite sealed bids from eligible bidders an EPC contract for the **CONSTRUCTION OF 25MW +/- 5% HFO FIRED POWER GENERATION PLANT .**

A bid Security of 2 % of the tendered sum must be submitted along with the bid.

Bids shall be valid for 90 days after the date of bid opening.

The complete bid document can be viewed on the GPL's website: www.gplinc.com

- Bids must be submitted with a valid National Insurance (NIS) & Guyana Revenue Authority (GRA) Compliance Certificate- *(Only Applicable to Local Suppliers)*

Deadline for submission of bids is 14:00 hrs. (2:00 p.m.) on **November 24, 2022**

Bidders must submit one (1) original hardcopy and two (2) electronic copies (readable and searchable) on USB Hard Drives in PDF format each for Option 1 - Canefield and Option 2 – Columbia. Both submissions must be placed in a single outer envelope clearly marked "CONSTRUCTION OF 25MW +/- 5% HFO=FIRED POWER GENERATION PLANT, GPL-PD-063-2022.

Bid opening is scheduled for 14:30 hrs (2:30 pm) on **November 24, 2022** at GPL's Board Room 91 Duke Street, Kingston, Georgetown, Guyana via Zoom Call in the presence of one Bidder/ Representative per bid, who may choose to participate.

IMPORTANT: Bidders downloading the bid document must forward by E-mail, a registration form to kgeorge@gplinc.com and proc_mng_sect@gplinc.com stating the following: Name of Bidder, Address, Contact No. and Email address.

All queries must be submitted only to tenderqueries@gplinc.com referencing name and bid document number.

The above information will be used to inform bidders of any amendments to the bidding document and also to forward all responses to queries.

GPL reserves the right to reject any or all bids.

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INSTRUCTIONS TO BIDDERS (ITB)

1 Introduction

1.1 Scope of works and Source of Funds

1.1.1 Description of the Project

Power transfer from the New Sophia Substation to Substations on the East Coast Demerara and West Berbice has reached a maximum of 20MW, which is approximately 15% of the total system load under normal operating conditions in 2022 . Preventative maintenance of the transmission lines between New Sophia and Onverwagt has been deferred on many occasions so that the link would remain available for the bulk transfer of power.

To lessen the dependency of bulk power transfer from New Sophia, it has been proposed that an EPC Contractor be engaged to construct 25MW HFO-fired Power Generation at either: (1) Pln. Canefield, Canje, Berbice or (2) Pln. Columbia, East Coast Demerara .

The Procuring entity is Guyana Power & Light Inc. (identified in the Bid Data Sheet and hereinafter referred to as “the Employer”) for the execution of the Works described in the Bid Data Sheet and will therefore use funds indicated in the Bid Data Sheet.

The scope is for Design, Inspect, Construct, Supply, Install, Test & Commission on an EPC/Turnkey basis.

1.1.2 Extent of the Works and Definition of Sections

The Contract covers the design, construction, supply, testing of works, insurance, packaging for export, shipping, transport, delivery to site, unloading at site, equipment erection, painting, testing, commissioning and putting into normal operation, performance and reliability testing on completion, instruction of the Employer's personnel and making good defects of the plant outlined below.

1.2 Eligible Bidders

- 1.2.1 This Invitation for Bids is open to all contractors from any country, exclusive of those prohibited by the legislation of Guyana or by another international agreement, the participant of which is Guyana.
- 1.2.2 A bidder may be an individual or legal entity, or a combination of any abovementioned forms with a formal intent to enter into an agreement or to operate under an existing agreement in the form of a Partnership.
- 1.2.3 Government and municipal enterprises may only participate if they are legally and financially autonomous, and if they are legally eligible to carry on business.
- 1.2.4 Bidders should not have a conflict of interests, should not be associated (nor have been associated in the past), directly or indirectly, with any firm or any of its affiliates that has been engaged by the Employer to provide consulting services at preparation stage of the bidding documents, technical specifications, project and other documents to be used for procurement of works in accordance with this Invitation for Bids or being proposed as Engineer under this Contract.
- 1.2.5 A Bidder or any affiliate that has been engaged by the Employer to perform consulting services at preparation stage of the bidding and other documents shall not be entitled to participate in bidding, and if conflict of interests is found, bidder' bid shall be rejected.
- 1.2.6 Bidders should provide information on legal status, place of registration and principal type of business; a license to execute the works specifying identification number and validity period, and a written power of attorney of the signatory of the bid to assume obligations on behalf of the Bidder;
- 1.2.7 The bidder should not have more than one improperly performed procurement contract within the past two years preceding the commencement of the present procurement proceeding.
- 1.2.8 The bidder should not be insolvent, bankrupt, their property should not be controlled by judicial authority, their cases should not be commanded by court or by the person appointed by court, their commercial activities should not be suspended, and they should not be a subject of such judicial proceedings.;
- 1.2.9 The bidder should fulfill the tax and social insurance fund liabilities in Guyana;
- 1.2.10 Bidders, and their management personnel within three years preceding the commencement of procurement proceedings should not be associated with giving false information or a misrepresentation as to their qualification information for the purposes of entering into a procurement contract;
- 1.2.11 Bidders should provide record of past experience for projects of a similar nature.
- 1.2.12 Bidders should provide information on major items of construction equipment proposed to carry out the Contract;
- 1.2.13 Bidders should provide information on the qualifications and experience of key management and technical personnel proposed for the Contract;
- 1.2.14 Every tender must be accompanied by a Method Statement of work. The Method Statement should show in as much details as possible how the Contractor intends to execute the work. Appropriate bar and any other charts should be included to depict sequence of the construction for each lot, all being represent on the same timescale. Any Tender received without a method statement would be disqualified;

1.2.15 The basic price lists, which are set out in the Schedule of Prices shall be completed by the Tenderer by inserting the rates of labour and the basic cost of materials and plant prevailing at the date of tender and shall be the rates and prices used in the calculation of the unit rates entered against the measured items in the price lists;

The Contractor shall submit with his tender, quotations received from suppliers for plant and materials, whose prices he intends to use in the compilation of his basic price list. The Contractor shall not add any other materials to the list of the basic materials.

1.3 Qualifications of Bidders

1.3.1 Information on bidders' qualifications is to be included in "Qualification Information" to be incorporated in the bid.

1.3.2 A bid submitted by a partnership or syndicate consisting of two or more firm-partners should comply with the following requirements:

- (a) The bid shall include all the above-listed information for each partnership or syndicate partner;
- (b) the bid shall be made up and signed so as to be legally binding on all partners;
- (c) one of the partners shall be nominated as being in charge, and his authorities should be confirmed by authorization to be signed by the authorized signatories of all partners;
- (d) the bid should incorporate a formal agreement of partnership (or a letter of intent to establish one) which specifies, inter alia, that all partners shall be liable jointly and severally for execution of the Contract, and that the partner in charge shall be entitled to incur liabilities and receive instructions for and on behalf of any and all partners, and all operations on the execution of the Contract, including payment shall be done exclusively by the partner in charge.

1.3.3 To qualify for award of the Contract, bidders should meet the qualification requirements set forth in the Bid Data Sheet.

1.4 One Bid per Bidder

1.4.1 Each Bidder shall submit only one Bid, either individually or as a partner in a partnership or syndicate. All bids involving the Bidder who submits or participates in more than one Bid (exclusive of subcontractors, or permitted or required alternatives) shall be rejected from participation in bidding.

1.5 Cost of Bidding

1.5.1 The Bidder shall bear all costs associated with the preparation and submission of the bid. The Employer shall not be responsible or liable for those costs.

- 1.5.2 The Bidder, at the Bidder's own responsibility and risk, may visit and examine the Site(s) of expected Works and its surroundings. All information obtained by the Contractor individually while visiting the site(s), may be used by him to prepare the bid and enter into the Contract. The costs of visiting the Site(s) shall be at the bidder's own expense. The bid submission means that the Bidder has examined the Site(s) of future Works and has accepted all the existing conditions.
- 1.5.3 Bidders needing to visit the Site(s) on other occasions should first obtain the permission of Guyana Power & Light, Inc. through the Project Manager who will arrange a mutually acceptable date, time and duration of such visit.
- 1.5.4 Bidders are advised that any Site visit shall be at the Bidder's own risk. Guyana Power & Light, Inc. will accept no responsibility for any damage or injury which may be caused to the Bidder's personnel or property as a result of any such visit.
- 1.5.5 Any Bidder who wishes to make any trial excavations, boreholes, investigations or tests at the site should make application to the Project Manager and suitable arrangements shall be made.

2 Bidding Documents

2.1 Content of Bidding Documents

2.1.1 The set of bidding documents includes the following:

- (a) Instructions to Bidders (ITB);
- (b) Bid Data Sheet (BDS);
- (c) Evaluation Criteria;
- (d) General Conditions;
- (e) Special Conditions;
- (f) Payment Schedule;
- (g) Letter of Technical Bid and Schedules to Bid
 - (i) Schedule A: Specific Works Data
 - (ii) Schedule B: Project Management Plan
 - (iii) Schedule C: Method of Performing Works
 - (iv) Schedule D: Proposed Program of Works
 - (v) Schedule E: Complete Technical Details of the Materials and Equipment Specifications with Catalogue, etc.
 - (vi) Schedule F: Works to be performed by Subcontractors
 - (vii) Schedule G: Deviations from Technical & Contractual Provisions

- (viii) Schedule H: Specimen JV Agreement
- (ix) Schedule I: Past performance and Present Commitments

- (h) Form of Price Bid & Schedules to Bid
 - (i) Form of Price Bid, (Form -B)
- (i) Schedule of Rates/ Schedule of Prices
- (j) Daywork Schedule
- (k) Schedule of Prices
- (l) Standard Forms
 - (i) Bid Security
 - (ii) Performance Security
 - (iii) Bank Guarantee for Advance Payment
 - (iv) Contract Agreement
 - (v) Indemnity Bond for Secured Advance
- (m) Specifications
- (n) Safety, Health & Environmental
- (o) Risk Assessment Checklist
- (p) Employer's Requirements
- (q) Technical Specifications

2.1.2 The Bidder shall examine all instructions, forms, conditions and technical specifications incorporated in the bidding documents. Failure to provide all information required in the bidding documents, or submission of a non-responsive bid may result in rejection of his bid.

2.2 Clarification/ Query of Bidding Documents

2.2.1 The Bidder requiring any clarification/query of the bidding documents may address the Employer at **tenderqueries@gplinc.com** as indicated in the Bid Data Sheet . The Employer will respond in writing to any request for clarification of the bidding documents to be received not later than 7 (seven) days prior to the deadline for submission of bids. Copies of response, including an explanation of matter's substance, but without identifying its source, will be forwarded by the Employer in writing to bidders who received the bidding documents within 5 (five) working days.

2.2.2 The Pre-bid Meeting and Site Visit will be conducted according to the decision of the Employer and, if so, at the time, date and address indicated in the Bid Data Sheet. Before the conference Bidders may address the Employer with questions for the conference, and at the conference may ask any question and receive answer to the questions submitted regarding the bidding documents. All information obtained at pre-bid conference, requests of potential bidders related to clarification of the bidding documents, and responses to them shall be recorded by the Employer, and by the results of conference, a record is made and promptly communicated to all Bidders who received the bidding documents in order to enable bidders to take them into account when preparing their bids.

2.3 Amendment of Bidding Documents

2.3.1 In special circumstances, at any time before expiry of the deadline for submission of bids, the Employer, for any reason, whether at its own initiative or in response to request for clarification forwarded by the Bidder, may modify the bidding documents by issuing addenda to it. Any addenda issued shall be a part of the bidding documents, and should be sent to all bidders who received the bidding documents from the Employer, which may be done by using fax or electronic message. Bidders should confirm the receipt of each addendum in writing or by fax or electronic message, and these addenda shall be binding.

2.3.2 In order to give Bidders enough time to take into account the amendments introduced while preparing their bids, the Employer, at his discretion, may extend the deadline for submission of bids.

2.3.3 The Employer at any time before expiry of the deadline for submission of bids may vary the scope of works quantities by a 20 percent increase or decrease.

3 Preparation of Bid

3.1 Language of Bid

The Bid prepared by the Bidder and all correspondence and documents related to this Bid that is exchanged by the Bidder and the Employer, should be written in the language specified in the Bid Data Sheet.

3.2 Documents Included in the Bid

The Bid prepared by the Bidder should include the following documents:

- (a) filled in Form of Bid;
- (b) qualification information and documents confirming that Bidder has a sufficient qualification required for the execution of the Contract in case if his bid accepted;
- (c) Schedule of Prices and priced list of consumable materials;

- (d) Bid Security provided in accordance with ITB clause 3.6;
- (e) General Conditions of Contract and Special Conditions of Contract (signed by Bidder page-by-page);
- (f) Technical Specifications used for the execution of the Works;
- (g) Alternative offers (at the Employer's request);
- (h) Other documents to be filled in by bidders in accordance with the requirements indicated in the Bid Data Sheet;
- (i) Power of attorney for signing the Bid.

3.3 Bid Price

- 3.3.1 The Contract is applicable to the whole amount listed in the Schedule of Prices and list of priced consumable material price presented by the Bidder in its bid.
- 3.3.2 The Bidder shall indicate the rates and prices for all kinds of works included in the Schedule of Prices , drawings and specifications. The kinds of works for which no rate and price is entered by the Bidder will not be paid for when executed, and it is considered that they are included in the rates and prices for other kinds of works.
- 3.3.3 When determining the bid price, the Bidder shall take into account the total value of labor, materials, plant, instruments, water, heat, electric power, transportation, machinery and equipment, and other services which are required during and for completion of the construction works.
- 3.3.4 Permanent Plant and Construction Equipment are exempt from import duties and taxes. Construction Service and locally procured material are not exempt from taxes such as VAT and should be included in the Bid Price.

3.4 Bid Currency

The Bidder shall submit all documents on mutual settlements, and shall indicate the bid price in United States Dollars.

3.5 Period of Validity of Bids

- 3.5.1 Bids shall be valid during the number of days indicated in the Bid Data Sheet after the date of bid opening. Bids with shorter validity period shall be rejected by the Employer as non-responsive to the bidding documents.
- 3.5.2 In exceptional circumstances, the Employer may request bidders to extend the period of validity of their bids for a certain period. Such requests and responses to them shall be made in writing, and may be sent by fax, telex or electronic mail. A Bidder may refuse the request on extension of the period of validity of his bid, without forfeiting the return of security. A Bidder agreeing to the request will not be required nor permitted to modify the bid, but will be required to extend the validity of bid security for a period of not less than 2 (two) weeks after the expiry of the extended period of bid validity.

3.6 Bid Security

- 3.6.1 The Bidder should provide, as part of its bid, the bid security in the amount and form specified in the Bid Data Sheet with a validity period of not less than 2 weeks after the expiry of a period of bid validity.
- 3.6.2 The Bid security should be expressed in the bid currency, or in another freely convertible currency, and shall be a bank guarantee issued by the bank located in Guyana or by local correspondent bank in case when the security is issued by the foreign bank, or in any other form permitted by the Bid Data Sheet, such as debenture bond, cash, shares accepted for public transactions, certificates of deposit to bearer or promissory notes. in the form of a Bank Guarantee or a bond from an Insurance Company licensed by the Bank of Guyana.
- 3.6.3 All bids not having a security shall be rejected by the Employer as non-responsive to the bidding documents.
- 3.6.4 The bid security shall be returned to unsuccessful Bidders as soon as possible but not later than fifteen (15) days upon the expiry of bid validity period, or after furnishing the performance security by successful bidder.
- 3.6.5 The successful Bidder shall receive the bid security after the signing of Contract pursuant to ITB Clause 6.7 and after furnishing the performance security (in the case when required).
- 3.6.6 The Bid security may be forfeited:
- (a) if the Bidder:
 - (1) withdraws its bid after the opening during the period of bid validity specified in its bid;
 - (2) does not agree with the correction of arithmetical errors in his its bid.
 - (b) in case of the Contract award to Bidder, if this Bidder fails:
 - (1) to sign the Contract on the terms and conditions specified in its bid, in accordance with ITB Clause 6.4 or
 - (2) to furnish the Performance Security, in accordance with clause ITB Clause 6.5.

3.7 Alternative offers at the request of the Employer

- 3.7.1 The Employer may request in the Bidding Documents for bid submission taking into account alternative conditions. In this case all requirements of the bidding documents are applied to alternative offers to that extent as well as to basic offers. The alternative offers shall not be considered, unless allowed or required in the bidding documents.
- 3.7.2 If so allowed by the Bid Data Sheet, the bidders wishing to submit the bids, taking into account the alternative conditions must also submit the bids that comply with the requirements of the bidding documents, including the basic technical features as indicated in the drawings and specifications. In addition to submitting the basic Bid, the Bidders shall provide all information necessary for a complete evaluation of the alternative conditions by the Employer, including design calculations, technical specifications, breakdown of prices, proposed construction methods and other relevant details.
- 3.7.3 Only the alternatives of Bidder who submitted the lowest evaluated Bid in accordance with the basic requirements of the bidding documents shall be considered by the Employer.
- 3.7.4 The Bidder, in its Bid, shall indicate the basic price of works to be executed, in accordance with the requirements of the bidding documents, and individually the price of works to be executed using the alternative offer.

3.8 Format and Signing of Bid

- 3.8.1 Each bidder shall prepare one (1) Original hardcopy and two (2) Electronic Copies (readable and searchable) on USB Hard Drive in PDF Format, of the documents comprising the bid and clearly mark the hardcopy as "ORIGINAL". In the event of discrepancy, the original shall prevail.
- 3.8.2 The original copy and all copies of the bid shall be typed or written in indelible ink, and shall be signed by the Bidder or by a person (persons) having all authorities to sign the bid and obligations under the Contract. Permission to sign the bid should be specified in the power of attorney to be provided with the bid. All pages of the bid where new information, change or erasure inserted should be initialled (signed) by the person or persons signing the bid.
- 3.8.3 The bid shall contain no interlineations, erasures or overwriting, exclusive of the cases when the Bidder needs to correct errors which should be initialled by the person or persons signing the bid.
- 3.8.4 All Bids must be accompanied by a Power of Attorney and such other documentation as may be necessary to show evidence that those signing the Bid are authorised to bind the Bidder fully and completely for the purpose of his Bid. Such Power of Attorney and documentation shall be witnessed by a Notary Public or the Chamber of Commerce and Industry or equivalent authority in the country of the Bidder and these documents shall be attached to the Bid.

4 Submission of Bids

4.1 Guide to the Submission of Bids.

4.1.1 Bids must be placed in sealed envelopes and addressed to:

The Secretary, Tender Board,
Guyana Power & Light Inc.
91 Duke Street, Kingston,
Georgetown, Guyana

and deposited in the Tender Box before 14:00 hours on November 24, 2022. Bidders using postal service must arrange for delivery by 14:00 hours on November 24, 2022.

4.1.2 Each bidder shall submit his bid as under:

An ORIGINAL hardcopy and two (2) ELECTRONIC COPIES (readable and searchable) on USB Hard Drives in PDF format in a sealed envelope and identified as given in ITB Clause 4.1.3 hereof..

4.1.3 The inner and outer envelopes shall;

- (a) Be addressed to the Employer at the address given in Sub-Clause 4.1.1 heretofore.
- (b) The inner envelopes shall each bear the Project name “ GPL-PD-063-2022 Option 1 – Canefield”, and “GPL-PD-063-2022 Option 2 – Columbia”.
- (c) The outer envelope shall bear the Project name “CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION PLANT, Bid No. GPL-PD- 063-2022” and Date of opening of Bid.
- (d) Provide a warning not to open before the time and date for bid opening.

- 4.1.4 The Bid shall be delivered in person or sent by registered mail at the address of the Employer as given in Sub-Clause 4.1.1 heretofore.
- 4.1.5 In addition to the identification required in Clause 4.1.3 hereof, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Sub-Clause 4.1.1.
- 4.1.6 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.
- 4.1.7 Bidder must submit valid certificates of compliance from Guyana Revenue Authority (GRA) and National Insurance Scheme (NIS), and VAT registration. (Only applicable to locally registered companies)

4.2 Deadline for Submission of Bids

- 4.2.1 Bids must be received by the Employer at the address and on the dates specified in the Bid Data Sheet.
- 4.2.2 The Employer may, at his discretion, postpone the deadline for submission of bids for later period by modifying the bidding documents, and in this case the validity period of all rights and obligations of the Employer and the Bidders shall be extended subject to the changed deadline date.

4.3 Late Bids

All bids received by the Employer after the deadline for submission of bids specified by the Employer shall be rejected and returned to Bidder unopened.

4.4 Modification and Withdrawal of Bids

- 4.4.1 The Bidder may modify or withdraw his bid after the bid submission, provided that the Employer will receive a written notice of modification or withdrawal of the bid before the expiry of determined deadline for submission of bids, duly signed by an authorized representative, and accompanied by a copy of the authorization.
- 4.4.2 The Bidder's modification or withdrawal notice should be sent via email to the electronic tender box, in accordance with the provisions of ITB Clause 4.1. In this case the subject of the email shall be "MODIFICATION" or "WITHDRAWAL", as appropriate. A withdrawal notice may also be sent as a telegram by telex or fax with a subsequent written confirmation though post-office not later than the deadline for submission of bids.
- 4.4.3 No changes should be added in the bids after the expiry of the period determined for bid submission.
- 4.4.4 No bid may be withdrawn or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity indicated by the Bidder on the Bid Form. Withdrawal of the bid during this interval may result in the Bidder's forfeiture of his bid security, in accordance with ITB Clause 3.6.6.

5 Opening and Evaluation of Bids

5.1 Opening of Bids by Employer

- 5.1.1 The Employer will open all bids in the presence of bidders' representatives who wish to participate in it at the time, on the date, and at the address specified in the Bid Data Sheet. The bidders' representatives who are present shall sign a register evidencing their attendance.
- 5.1.2 The envelopes marked as "WITHDRAWAL" and "MODIFICATION" will be opened first and read out. In this case the bids for which a withdrawal notice has been sent in accordance with Clause 4.4.1, the envelopes shall be returned to Bidders unopened.
- 5.1.3 The bidders' names, the Bid prices, including alternatives (if alternatives permitted), price reduction specified in the Bidder's bid, information on the presence or absence of required Bid Security, information on the presence (absence) of tax debts and debts of social insurance payments will be announced at the opening. No bid may be rejected in the bid opening, exclusive of the late bids which should return to Bidder unopened.
- 5.1.4 Bids (and modifications sent pursuant to ITB Clause 4.4.2) that have not been opened and read out at the opening shall not be accepted for further evaluation, irrespective of circumstance.
- 5.1.5 The Employer shall maintain the minutes of Bid opening where information to be disclosed to those who are present and to be promptly sent to the Authorized State Procurement Body is included.

5.2 Confidentiality Observance and Contacting the Employer

- 5.2.1 Information relating to the examination, evaluation and comparison of bids, and recommendations for the award of a Contract shall not be disclosed to other persons interested in this process until information on award of the Contract will be given to all Bidders.
- 5.2.2 No Bidder shall contact the Employer on any matter related to his bid from the date of bid opening and until the date of contract award, exclusive of requests for clarification of the bid.
- 5.2.3 Any effort on the part of any Bidder to influence the Employer's decision on the bid evaluation, bid comparison, or the Contract award may result in the rejection of this Bidder's Bid.

5.3 Clarification of Bids

During the bid evaluation, the Employer may, at his discretion, request the Bidder to give clarifications on his Bid. The request for clarification and the response should be given in writing, and in this case no change in the price or substance of the bid shall be sought,

offered, or permitted, exclusive of the cases when required to correct arithmetical errors discovered by the Employer during the evaluation of bids in accordance with ITB Clause 5.5.

5.4 Preliminary examination of Bids

5.4.1 Prior to the detailed evaluation of bids, the Employer will examine the bids in order to determine whether they meet the eligibility criteria; whether there is a bid security, whether the documents have been properly signed; whether they are substantially responsive to the requirements of the bidding documents.

5.4.2 A substantially responsive bid is one which satisfies all the above provisions without a material deviation, reservation or omission. A material deviation reservation or omission is one:

(a) which affects in any substantial way the scope, quality, or performance of the Works;

(b) which limits in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the Bidder's obligations under the Contract; or

(c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

They concern, for example, such important provisions as the bid security, bidders' qualification information, and effect on the scope, quality, or performance of the works, taxes and insurance payments are deemed a material deviation. Determination by the Employer of each bid's degree of responsiveness to those requirements should be based on the content of the bid itself without reference to any additional sources.

5.4.3 The Employer may waive any minor nonconformity, small mistake or inaccuracy in the bid which are not a material deviation from the requirements of the bidding documents, and such non-conformity or inaccuracy shall not influence on evaluation of the bid. When the minor omissions do affect the evaluation of the bid (e.g., costs to the Employer, or other aspects of the required performance), the minor deviations should be quantified in monetary terms, with corresponding adjustments to the bid price (only for the purposes of comparing bids)

5.4.4 If the bid is not substantially responsive to the qualification requirements, it shall be rejected by the Employer, and may not be subsequently accepted as responsive after inclusion of appropriate corrections made by the Bidder.

5.5 Correction of Arithmetical Errors in Bids

5.5.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetical errors. Errors will be corrected by the Employer as follows:

(a) when there is a discrepancy between the value expressed in figures and words, the value in words will govern; and

(b) when there is a discrepancy between the unit rate and the total resulting from multiplying the unit rate by the quantity, the unit rate will govern, unless in the opinion of the Employer, there is an obviously gross misplacement of the decimal fraction, in this case the total will govern and the unit rate will be corrected.

5.5.2 The value indicated in the bid, by the Bidder's consent, will be adjusted by the Employer in accordance with the above-stated rules of correction of errors, and is deemed mandatory to the Bidder. If the Bidder does not accept the corrected bid price, the Bid shall be rejected, and the bid security may be forfeited in accordance with Clause 3.6.6

5.6 Evaluation and Comparison of Bids

5.6.1 The Employer will evaluate and compare only the bids determined to be substantially responsive to the requirements of the bidding documents in accordance with Clause 5.4.1.

5.6.2 When evaluating the bids, the Employer will determine for each Bid, the Evaluated Bid Price by adjusting the Bid Price as follows:

(a) Correction of arithmetical errors pursuant to Clause 5.5

(b) Exclusion of provisional sums and costs for contingencies pursuant to the Schedule of Prices;

5.6.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors which are in excess of the requirements of the bidding documents or otherwise result unsolicited benefits for the Employer will not be taken into account in bid evaluation.

6 Award of Contract

6.1 Award Criteria

Exclusive of the cases provided for in Clause 6.2 the Employer will award the Contract to the Bidder whose bid is determined to be substantially responsive to the bidding documents, and who scores the highest Evaluated points, provided that this Bidder has been determined to be

(a) eligible in accordance with Clause 1.2 and

(b) met with qualification requirements in accordance with Clause 1.3

6.2 Employer's Right to accept any Bid and Reject any or All Bids

- 6.2.1 The Employer reserves the right to accept or reject any or all bids, and to annul the bidding process at any time prior to the award of Contract, without thereby incurring any liabilities to bidders.
- 6.2.2 In case when the bidding process annulled, the Employer should, during 3 working days, send to all Bidders a notification indicating the reasons which served as a ground for the annulment, without giving evidences of that ground.

6.3 Notification of Award

- 6.3.1 Within 3 days after the conducted selection of the successful Bidder, and before the expiry of the period of bid validity, the Employer will notify the successful Bidder by telex, fax or email confirming by registered letter that his bid has been determined to be successful. This letter (hereinafter and in «the General Conditions of Contract» called «the Letter of Acceptance») should refer to the sum that the Employer shall pay to the Contractor for execution of the Works in accordance with the Contract (hereinafter and in the Contract called «the Contract Price»).
- 6.3.2 The notification of award shall be equivalent to entering into a Contract, subject to the Bidder providing the performance security pursuant to Clause 6.5 and will sign the Contract pursuant to Clause 6.4.
- 6.3.3 At the same time that notification of award is given to the successful bidder, the Employer shall notify other bidders in writing of the selection, including the name of the successful bidder and the bid price. The Employer shall also publish a notice in the Public Procurement Bulletin indicating the name and address of the successful bidder and the bid price quoted by him.
- 6.3.4 Unsuccessful bidders may request in writing to the Employer for a debriefing seeking explanations for the failure of their bids. The Employer shall promptly respond in writing to any unsuccessful Bidder who requests the Employer in writing to explain on which grounds its bid was not selected.

6.4 Signing of Contract

- 6.4.1 At the same time with notification of award, the Employer will send to the successful Bidder, the Form of Contract contained in the Bidding documents.
- 6.4.2 During fourteen (14) days of the receipt of a written Notice of acceptance and the Form of Contract, the successful Bidder should sign and date the Contract, and return it to the Employer.

6.5 Performance Security

- 6.5.1 Together with the signed Contract, the successful Bidder will send to the Employer, the Performance Security in the amount indicated in the Bid Data Sheet.
- 6.5.2 If the successful Bidder fails to provide the performance security, or during 14 (Fourteen) days does not return the Contract signed, then the Employer shall reject the bid and confiscate the bid security, in that case the Employer shall award the Contract to the next highest evaluated Bidder,, whose bid is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily, subject to the Employer's right to reject all bids in accordance with Clause 6.2, and the applicable Law and Regulations.

6.6 Corrupt and Fraudulent Practices

- 6.6.1 The Employer requires that the Bidders observe the highest standards of ethics during the procurement and execution of such Contracts. In pursuance of this policy, the Employer:

(a) for the purposes of provisions of this Clause, uses the following notions:

I. "corrupt practice" - means the offering, giving, the agreement requesting for remuneration in any form, or services rendering in order to influence the action of a public official in the procurement process or in contract execution; and

II. "fraudulent practice" - means a misrepresentation of facts in order to influence a procurement process or the execution of a Contract to the detriment of the Employer, including collusive practices among Bidders (prior to or after bid submission), to establish bid prices at artificial non-competitive level, and deprive the Employer of the benefits of free and open competition;

III. "collusive practice" means a scheme or arrangement between two or more bidders, with or without the knowledge of the Employer, designed to establish bid prices at artificial, non-competitive levels; and

IV. "coercive practice" means harming or threatening to harm (directly or indirectly), persons or their property to influence their participation in the procurement process or the execution of a contract;

(b) will reject the bid if it determines that the Bidder recommended for award of the Contract has engaged in corrupt, fraudulent, collusive or coercive practices during the bidding process or execution of a contract;

(c) will declare the Contractor for indefinite, or for a specified period of time to be ineligible to participate in the state-financed biddings in accordance with a Regulation

on the establishment of Database of unreliable (unfair) suppliers and its application procedures.

6.7 Penalties

A penalty for slow or non-performance will be imposed as per the rate prescribed for Liquidated Damages. Slow or non-performance will be assessed against the project's approved work programme and will commence from the first quarter of the project life.

(Note: This means that after 15 % of the contract sum is deducted for penalties, the Procuring Entity has the right to cancel the contract and demand all forms of damages).

6.8 Bid Data Sheet (BDS)

Below given the specific data on procurement of the works shall complement, supplement or amend the provisions of the Instructions to Bidders (ITB). Whenever there is a conflict between the provisions herein and the Instructions to Bidders, the former shall prevail.

Item №	A. General
ITB 1.1.1	<p>The Employer is: Guyana Power & Light Incorporated</p> <p>Identification Number GPL-PD-063-2022</p> <p>The works are:</p> <p style="text-align: center;">Construction of 25 MW +/- 5% HFO-Fired Power Generation Plant:</p> <p style="text-align: center;">Option 1 –Pln. Canefield, Canje Berbice</p> <p style="text-align: center;">Option 2 – Pln. Columbia, East Coast Demerara.</p> <p>The source of financing is: The Guyana Power & Light Incorporated</p>
ITB 1.1.2	<p>The Name of the Project is:</p> <p style="text-align: center;">Construction of 25 MW +/- 5% HFO- Fired Power Generation Plant</p> <p>The Intended Completion Date is within twelve (12) months after Notice to Proceed.</p>

	The defects liability period is twelve (12) months after Plant Acceptance.
ITB 1.3.3	To qualify for award of the Contract, bidders should meet the mandatory requirements as outlined in the Evaluation Criteria and awarded the lowest evaluated cost.
	B. Bidding Documents
ITB 2.2.1	For clarification/ query purposes only, the Employer’s address is: Attention: Supply Chain Manager - Procurement Address: 40 Main Street, Georgetown, Guyana. Email: tenderqueries@gplinc.com
ITB 2.2.2	<p>GPL intends to host a Site Visit to the plant sites; Columbia, and Canefield on November 09, 2022.</p> <p>2. GPL intends to host a Pre-Bid Meeting on November 16, 2022, via a virtual platform. GPL will share the link on or before November 8th, 2022.</p> <p>3. The purpose of the Pre-Bid Meeting is to answer any questions prospective Applicants may have concerning the Bid. Prospective Applicants may continue to submit questions concerning the Bid in writing to GPL up to seven (7) Days before the Deadline for Submission of proposals. No further submissions regarding the Bid will be entertained after that time.</p> <p>4. Any additional information or any modifications to the Bid will be made available by GPL exclusively through the issuance of an Addendum to the Bid and will be issued directly to prospective Applicants who have confirmed their intention to Bid in accordance with Registration Form.</p> <p>5. Notice of the Pre-Bid Meeting will be issued directly to all registered Applicants who have downloaded the Bid Document in accordance with Registration Form.</p>
	C – Preparation of Bid
ITB 3.1	The language of Bid is English
ITB 3.4	The Bid Currency shall be in United States Dollars
ITB 3.5.1	The period of Bid validity is 90 days .
ITB 3.6.1	The amount and form of Bid Security is 2% of the Bid Price.
ITB 3.7.2	Alternative bids will not be accepted for evaluation.

	D – Submission of Bids
ITB 4.1.3	Certificates of compliances from NIS, GRA and Vat Registration for local companies
ITB 4.2.1	Deadline for submission of bids is 14:00 hrs. (2:00 p.m.) November 24, 2022.
	E – Opening and Evaluation of Bids
ITB 5.1.1	Bid opening is scheduled for 14:30 hrs (2:30 pm) on November 24, 2022 at GPL’s Board Room 91 Duke Street, Kingston, Georgetown, Guyana via a virtual platform or in the presence of one Bidder/ Representative per bid who may choose to participate.
ITB 5.4	Sub clause 5.4.1, 5.6.1 and 5.6.2 applies. See Page 27 Evaluation Criteria (Clause 6.9)
	F – Award of Contract
ITB 6.5.1	The amount of Performance Security shall be 10% of Bid Price , and in the form of a Bank Guarantee or a bond from an Insurance Company licensed by the Bank of Guyana.

6.9 Evaluation Criteria

GPL will evaluate and rank Proposals determined to be substantially responsive to the requirements of the Tender.

The criteria to be used by GPL will involve the following stages:

- Phase 1: Preliminary Examination of Mandatory Requirements;
- Phase 2: Technical Evaluation of Proposal; and
- Phase 3: Non-technical Evaluation of Proposal.

Only Tenders considered to be substantially responsive to Phase 1 will be considered for Phase 2.

Only Tenders achieving 50% of the maximum points for Technical Points Award and Project Delivery in Phase 2 shall be deemed Technically Adequate and progress onto Phase 3.

At Phase 3, the Bid Evaluation Cost shall be calculated **ONLY** for Proposals that satisfy the requirements mentioned above and shall be scored accordingly by referencing the Proposal with the Bid Evaluation Cost.

The Proposal with the highest total amount of points in Phases 2 and 3 shall be considered the No. 1 Ranked Proposal and shall be invited to finalise the EPC Contract.

Phase 1 of Evaluation – Mandatory Requirements

Item #	Mandatory Requirements – <i>Completeness of Document</i>	Responsive
	<i>Must Conform to applicable Administrative Compliances</i>	
1	Submission of Valid Company Registration	
2	Submission Of Valid Certificate Of Compliance – GRA (only applies to suppliers whose registered business address is within Guyana)	
3	Submission of valid certificate of compliance – NIS (only applies to suppliers whose registered business address is within Guyana)	
4	Copies of audited financial reports for the last three years	
5	Validity Of Bid – Including Documents that are properly signed	
7	Manufacture Authorization	
8	Bids Should Be valid for Ninety (90) Days	
9	Record of Past Experience for Projects of a similar nature	
10	Price and Delivery Schedule	
11	Technical Specification – Compliance, completeness, legible, unambiguous	
12	Warranty period of 12 months	
13	Bid Security of 2% of Contract Sum	
14	Country of Origin	

Phase 2 Technical Evaluation

	Category	Criteria	Max Points	Evaluation Formula
Generator Set	Net Power Output, KW	Net power output shall mean the total plant power output measured at the low voltage side of the step-up transformer (i.e. summation of generators terminal output less the total auxiliary consumptions including Fuel Handling System and excitation power, cooling system and all other auxiliary systems and losses which are normally required in continuous operation).	20	Highest Output/Bid Output*20
	NOx Level (at 15% O2)	Emission at engine load of 100%	10	Lowest NOx level/Bid NOx Level*20
	Noise Level (db)	Maximum level of 85dB one (1) meter from Modular Plant	10	Lowest dB/Bid db*10
	Net Heat Rate (LHV of fuel) at load & at Site Condition. Not greater than 8.5 MMBtu/MWh nominal rating	Heat rate test points 100% 75% 50%	25	Lowest NHR/Bid NHR*25
	Lube Oil Consumption, g/Kwh	Maximum of 0.5g/Kwh	10	Lowest Consumption/Bid Consumption*10
Step-up	Total Ownership Cost (TOC)	Lowest calculated TOC shall receive maximum points.	10	Lowest TOC/Bid TOC*10
Medium Voltage Switchgear	Thermal Rating	Minimum of 3000 A	5	
	Short circuit withstand Capability (IEEE C37.04)	Minimum of 40 kA	5	
	BIL at 69kV/13.8kV	Minimum of 350kV/110kV	5	
	Total	Accumulated	100	

Notes:

$$\text{TOC} = \text{Bid Price} + [(A \times \text{NLL}) + (B \times \text{LL})]$$

Where:

1. **TOC** is the Total Owning Cost in US\$
2. **Bid Price** in US\$

3. **A** is the No Load-Loss Factor = 14.82 US\$/W
4. **B** is the Load-Loss Factor = 3.63 US\$/W
5. **NLL** is the No-Load Loss in W
6. **LL** is the Load Loss in W

Phase3 Non-technical Criteria

Category	Criteria	Max Points	Evaluation Formula
Delivery Time	Immediate Delivery or Earliest possible Time After signing Contract or receipt of Purchase Order.	30	Shortest Bid Delivery Time/Bid Delivery Time*30
Evaluation Cost	The Bid that offers the lowest cost shall be considered as the best option.	70	Lowest Bid Evaluation Cost / Bidder's Evaluation Cost Cost*70
Total	Accumulated	100	

Calculation of Bid Evaluation Cost:

Evaluation Cost (US\$) = Arithmetically Correct Bid Price (US\$) + 4 Year Fuel Cost (US\$)

- **Year Fuel Cost (US\$) = Fuel Required (Imperial Gallon) x 2US\$/Imperial Gallon.**
- **Fuel Required (Imperial Gallon) = Gross Electricity Generated (MWh) x Gross Plant Efficiency (Imperial Gallon/MWh).**
- **Gross Electricity Generated (MWh) = 25 MWx 8760 h/Year x 4 Year x 80% Capacity Factor = 700,800 MWh.**
- **Gross Plant Efficiency = Bidder's Submission in Imperial Gallon/MWh**

Note - Arithmetically Correct Bid Price: Proposals that are within the acceptable capacity range (+/-5% of 25 MW) shall be adjusted accordingly to reflect the notional price for a 25 MW plant using the average cost per MW for that Bid.

Avg Cost per MW= Bid Price/Capacity of Plant.

6.10 Law of Guyana: Procurement Act 2003

Section 39 – Subsection 6 (b)

(b) The procuring entity may grant a margin of preference not exceeding ten percent to tenders submitted by domestic contractors or for the benefit of tenders for domestically produced goods, provided that such preference is specified in the tender documents. If the lowest evaluated tender was submitted by a foreign tenderer, the evaluating committee will apply the margin of preference to the prices submitted by all foreign tenderers, for evaluation purpose. If, after applying the margin of preference, the lowest evaluated tender was submitted by a domestic tenderer, such tenderer shall be awarded the contract. Otherwise, the foreign tenderer who has submitted the lowest evaluated tender shall be awarded the contract.

7 General Conditions of Contract (GCC)

General provisions

7.1 Definitions

Below given terms in this Contract shall be interpreted as follows:

"**Schedule of Prices**" means the completed priced items of works and priced consumable materials which are the part of the Bid.

"The **Completion Date**" means the date of completion of the Works accepted by the Working Committee pursuant to Certificate of Commissioning, or in case of repair works, the final Certificate of Performed Works of the Contractor approved by the Engineer. It is the date of approval of Taking Over Certificate by Employer.

"**Contract**" means the Contract achieved between the Employer and the Contractor, and fixed as the form of Contract signed by the parties with all annexes and addenda to the Contract for the execution and completion of the Works.

"**Contractor**" means an individual or legal entity, or a partnership, whose Bid for the execution of the Works is accepted by the Employer.

"**Contractor's Bid**" means the completed bidding documents submitted by the Contractor to the Employer.

"**Contract Price**" means the amount to be paid to the Contractor under the Contract for the entire and duly performance of his contractual obligations.

"**Days**" mean calendar days; "**months**" mean calendar months.

"A **Defect**" means any part of the Works executed breaching terms of the Contract.

"The **Acceptance Report of Corrected Defects**" means the acceptance report drafted jointly by the Engineer and the Contractor after correction of defects by the Contractor.

"The **Defects Correction Period**" means the period to correct imperfections and defects indicated in the Special Conditions of Contract and calculated from the Completion Date.

"**Drawings**" include all calculations, schemes, plans and other information provided, or approved by the Authorized Body for the execution of the Contract.

«**Compensation Events**» means the event defined in Clause 11.5 of the General Conditions of Contract.

"**Employer**" means the party, as defined in the SCC, which employs the Contractor to execute the Works.

"**Machinery and equipment**" mean all the Contractor's machinery, equipment and vehicles to be brought temporarily to the Site for the execution of the Works.

"**The Initial Contract Price**" means the Contract Price indicated by the Employer in the Letter of Acceptance.

"**The Expected Period of Completion**" means when the Contractor should complete the execution of the Works indicated in the SCC.

"**Materials**" means all consumable and raw materials to be used by the Contractor and subcontractor during the execution of the Works.

"**Plant**" means the integral part of the Works which has a mechanical, electrical, chemical or biological function.

"**Engineer**" means a competent person, identified in the SCC, appointed by the Employer to be the Engineer, and notified to the Contractor, to be responsible for supervising the execution and quality of the Works.

"**Site**" means the territory, as defined in the SCC, allotted for the execution of the Works.

"**Technical Specification**" means the technical specifications of the Works included in the Contract, and any modifications of, or addenda to these specifications approved by the Employer.

"The **Start Date**" means the latest date, as given in the SCC, when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

"A **Subcontractor**" means an individual or legal entity, entering into a Contract with the Contractor to execute the part of the Works under the Contract, including the work of the Site.

"**Temporary Structures**" means the structures designed, constructed, installed and dismantled by the Contractor, and which are required for the execution of the Works.

"**Modification**" means a written instruction given by the Engineer to modify quantity of the Works, or items.

"The **Works**" means that the Contractor should construct, install, and hand over to the Employer under the Contract the execution of quantity of the Works, or completion of the Works, as defined in the SCC.

7.2 Contract Documents

7.2.1 Below listed documents shall constitute the Contract, and shall be its integral part, and shall be interpreted in the following order of priority:

- (a) Contract,
- (b) Letter of Acceptance,
- (c) Contractor's Bid,
- (d) Special Conditions of Contract,
- (e) General Conditions of Contract,
- (f) Technical Specifications,
- (g) Drawings,
- (h) priced Schedule of Prices, and priced Basic Price List; and,
- (i) any other documents listed in the Special Conditions of Contract to be as a constituent part of the Contract.

7.3 Language and Law

7.3.1 The language of the Contract and the applicable laws governing the Contract are stated in the Special Conditions of the Contract.

7.4 Engineer

7.4.1.1 Except where otherwise specifically stated, the Engineer will decide contractual relationships between the Employer and the Contractor, representing the Employer.

7.5 Official communication between the Employer and the Contractor

7.5.1 Official communication between the parties under the implementation of the Contract conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

7.6 Entering into subcontract

7.6.1 The Contractor may enter into subcontracts with the approval of the Engineer, but may not assign the Contract without the approval of the Employer in writing. In case of entering into more than one Contract with subcontractors, the Contractor shall coordinate the activities of those subcontractors. Presence of subcontractors shall not alter the Contractor's liability for performance of the contract.

7.7 Personnel

7.7.1 The Contractor shall employ the personnel for key positions in order to perform the functions specified in the «Qualification Information». The Engineer shall approve any proposed replacement of the key personnel only if their relevant qualifications and skills are the same or better than those of the personnel listed in the Qualification Information».

7.7.2 If for any reason the Engineer asks the Contractor to remove the person who is a staff member or employee of the Contractor or subcontractor, the Contractor should ensure that this person leaves the Site within three days, and no longer be engaged in the work under this Contract.

7.8 Employer's and Contractor's Risks

7.8.1 The Employer and the Contractor carry the risks which are the Employer's risks or the Contractor's risks under this Contract.

7.9 Employer's Risks

7.9.1.1 From the Start Date and until the Completion Date, or until the defects have been fully corrected, the following risks will be the Employer's risks:

(a) The risk of personal injury, or, death, or loss of or damage to property (exclusive of the Works, Plant, Materials, Machinery and Equipment) in consequence of:

(i) using or occupying the Site by the Employer for the execution of the Works, or for other purposes which may be an unavoidable result of the Works or

(ii) negligence, improper fulfillment of official duties, or violation of legal rights of the Contractor by the Employer, or by any person employed by him, or under the Contract, exclusive of the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Machinery and Equipment to the extent that is due to a fault of the Employer, or in the Employer's design defect, or due to war or radioactive contamination directly affecting the country where the works are to be executed.

7.9.2 From the Completion Date and until the defects have been fully corrected, the risk of loss of or damage to the Works, Plant and Materials is the Employer's risk, exclusive of the cases when loss or damage caused by:

- (a) the defect which existed on the Completion Date;
- (b) the event which occurred before the Completion Date and which is related to the Employer's risks, or
- (c) the activities of the Contractor on the Site after the Completion Date.

7.10 Contractor's Risks

7.10.1 From the Start Date and until the defects have been corrected, the risk of personal injury, death, and loss of or damage to property (including the Works, Plant, Materials, Machinery and Equipment) which are not the Employer's risks are the Contractor's risks.

7.11 Contractor to Execute the Works

7.11.1 The Contractor shall construct and install the Plant in accordance with the Specifications, Drawings, Schedule of Prices and/or pursuant to the Defects Report.

7.12 The Works to Be Completed by the Expected Period of Completion

7.12.1 The Contractor may begin the execution of construction Works from the Start Date, and he should execute the Works in accordance with the Work Execution Schedule submitted by the Contractor and approved by the Engineer, and the Contractor must complete the construction Works by the Expected Period of Completion.

7.13 Construction of Temporary Structures

7.13.1 The Contractor shall submit to the Engineer the specifications and drawings indicating the expected construction of Temporary structures to be approved by the Engineer, provided that they comply with the Specifications and drawings.

7.13.2 The Contractor should, when required, co-ordinate the project of Temporary structures with the third party.

7.14 Accident Prevention

7.14.1 The Contractor shall be fully responsible for the safety of all activities on the Site.

7.15 Discoveries

7.15.1 Anything of historical or other interest or of significant value discovered on the Site shall be the property of the Employer. The Contractor should notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

7.16 Investigation and Use of Site

7.16.1 During the execution of the Works, the Contractor shall rely on the Site Investigation Reports, and may visit and investigate the Project Site. All information obtained by the Contractor during the Site visit, shall be used for the execution of the Works.

7.16.2 The Employer shall give the Contractor the right for using the whole Site which is allotted for project construction. If the right for using any part of the Site is not given by the date indicated in the Special Conditions of Contract, the Employer will be deemed to have delayed the start of the certain kinds of project works, in this case the Employer should extend the construction period for the period of transferring the Site.

7.17 Access to the Site

17.1 The Contractor shall allow the Engineer and any other person authorized by the Engineer, access to the Site or to any other place where work is being carried out or is expected to be carried out according to the Contract.

7.18 Orders and instructions

7.18.1 The Engineer, within his authority, may take a decision; give orders and instructions to be binding upon the Contractor.

7.18.2 If the Contractor assumes that decision taken by the Engineer exceeds the authority presented by the Engineer under the Contract, or decision was taken wrong, it shall be dealt with under SCC clause 19 .

7.18.3 Dispute or disagreement arising between the Employer and the Contractor shall be settled in accordance with the Laws of Guyana.

7.18.4 Notwithstanding any references to trial herein, the parties shall continue to perform their obligations under the Contract, unless otherwise agreed.

8 Time Control

8.1 Work Execution Schedule

- 8.1.1 Within the time period specified in the Special Conditions of Contract, the Contractor shall submit to the Employer for approval the Work Execution Schedule where general methods of arrangement, procedure and period of execution of works on the Project construction are stated.
- 8.1.2 The Contractor shall submit, within the time periods specified in the Special Conditions of Contract to the Engineer for approval, the updated version of the Work Execution Schedule, taking into account the actual progress of performed works, and its impact on the time period of remaining works, including available changes in the sequence of execution of the works.
- 8.1.3 If the Contractor does not submit the updated Work Execution Schedule during the indicated period, the Engineer may retain the amount specified in the Special Conditions of Contract from the next Certificate of Performed Works, and continue to retain that amount until the delayed Work Execution Schedule is provided.
- 8.1.4 The Engineer's approval of the Work Execution Schedule shall not alter the Contractor's obligations. The Contractor may revise the Work Execution Schedule, and submit it to the Engineer again at any time. The revised Work Execution Schedule should demonstrate the effect of Modifications and Compensation Events.

8.2 Delays Ordered by the Engineer

- 8.2.1 The Engineer has a right to give order to the Contractor to suspend the start or progress of execution of the works on the Project construction.

8.3 Early Warning

- 8.3.1 The Contractor shall inform the Engineer as soon as possible of likely specific events, or circumstances that may negatively affect the quality of the works, increase the Contract Price or delay the execution of the Works on the Project construction. The Engineer may require the Contractor to assess the expected impact of the future event or circumstance on the Contract Price and Completion Date. The Contractor should provide such assessment within a short time.
- 8.3.2 The Contractor shall assist the Employer in preparing and analysing proposals regarding for that how to the consequence of such an event or circumstance can be avoided or reduced by anyone involved in the work, and in carrying out any instruction of the Engineer resulting from those proposals.

9 Quality Control

9.1 Identifying Defects

- 9.1.1 The Engineer shall check the works of the Contractor and notify the Contractor of the defects found. Such checking shall not involve the change in the Contractor's responsibilities. The Engineer is entitled to require the Contractor to search for a defect, and to uncover and check the results of works that the Engineer considers may have a Defect.
- 9.1.2 The "Defects Liability Period" for the work is 12 months from the date of taking over possession or such other period as may be specified in the Bid Data Sheet.

9.2 Tests

24.1 If the Engineer instructs the Contractor to carry out tests not provided for in the specifications to check whether the performed work has a defect, and if as a result the test shows that it does, the Contractor shall pay for the test. If there is no defect, the payment for the test shall be done by the Employer and it shall be a Compensation Event.

9.3 Correction of Defects

- 9.3.1 The Engineer should notify the Contractor in writing of any defect before completion of the Defects Correction Period, which begins at Completion Date, and its duration is determined in the Special Conditions of Contract.
- 9.3.2 Upon receipt of each notice of Defect, the Contractor should correct the indicated Defect within the time period specified in the Engineer's notice.

9.4 Uncorrected Defects

26.1 In case if the Contractor has not corrected the Defect within the time period specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor should pay those costs.

10 Cost Control

10.1 Schedule of Prices

- 10.1.1 The Schedule of Prices includes the priced kinds of works and value of consumable material for the construction, installation, testing and commissioning of the Works to be executed by the Contractor.
- 10.1.2 The Schedule of Prices in the bid is used for calculation and payment for the Contract Price. The Contractor shall receive the payment for the executed amount of works at the rate and price, and value of consumable materials indicated in the Schedule of Prices for each kind of work.
- 10.1.3 Changes in Quantities
- 10.1.4 In exceptional circumstances, the Employer, as may be industrially required, may change quantity of any works, or individual kinds of works.
- 10.1.5 At the request of the Employer, the Contractor within 7(seven) days of receipt of request should provide the Employer with a detailed breakdown of prices of change in the quantities indicating the rates for kinds of works and value of consumable material. The Employer shall evaluate those rates and value of consumable material in comparison with the Schedule of Prices provided by the Contractor with his Bid.
- 10.1.6 In case if during the comparison, the rate and value of consumable material will correspond with the rate and value of consumable material given in the Schedule of Prices, the Employer shall issue the Contractor a "Work order" for the execution of changed quantities.
- 10.1.7 If the rate and value of consumable material shall not correspond with the rate and value given in the Schedule of Prices, or if in the Employer's judgment, shall be unreasonable, the Employer instructs the Engineer to prepare a budget for Changed quantities, or for individual kinds of works, and on the basis of his own forecast, issues the Contractor a budget in the Work order format to execute for changed quantities.
- 10.1.8 The Contractor does not have a right for additional payment as a compensation of expenditure which one might avoid by giving an early notice.

10.2 Certificate of Performed Works

- 10.2.1 The Contractor shall monthly submit to the Engineer for payment the certificates of actually performed works prepared pursuant to the Schedule of Prices after deduction of aggregate payments of previously approved quantities.
- 10.2.2 The Engineer should check the Contractor's monthly certificates of performed works and approve them for payment to the Contractor.
- 10.2.3 The value of performed works should be determined by the Engineer, and should involve the value of all actually performed quantities in accordance with items of works, rates and value of consumable material under the Schedule of Prices.

10.2.4 The value of performed works should include the value of Work order (additional works) and of Compensation Event.

10.2.5 The Engineer may exclude, based on subsequent circumstance, any items certified in a previous certificate of performed works for payment, or reduce the proportion of any item previously certified in any certificate of performed works for payment in the light of later information.

10.3 Payments

10.3.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor sums according to the certificates of performed works confirmed by the Engineer during 28 days after the date of invoicing pursuant to the certificate of performed works. In case when the payment is delayed, the Employer shall pay interest to the Contractor indicated in the Special Conditions of Contract against the delayed payments. Interest is calculated from the date by which the payment should be made and until the date when the last payment has been made.

10.3.2 In case if the cost of certificate of performed works is increased as a result of decision of Arbitrator or Judge of General Jurisdiction, interests will be charged from the date of affirmation by the Engineer of the certificate of performed works for which the quantities have been increased without any dispute.

10.3.3 The kinds of Works for which no rate or price, and value of consumable material is entered in will not be paid for by the Employer, and shall be deemed included in other kinds of Works.

10.4 Retention

10.4.1 The Employer shall retain an amount, as detailed in the SCC, which shall not exceed 5 % of the contract sum.

10.4.2 On the Completion Date half of the whole retention shall be returned to the Contractor and the second half shall be returned after completion of the Defects Correction Period, provided that all Defects indicated in the notice and certified by the Engineer have been corrected.

10.4.3 After entire completion of Works, the Contractor may substitute retention money with an "on demand" bank guarantee.

10.5 Liquidated Damages.

10.5.1 In case of a failure in the Completion Date towards the Expected Period of Completion, the Contractor shall pay the Employer liquidated damages specified in the Special Conditions of Contract for each date of delay of the actual Completion Date against the Expected Period of Completion. The total amount of liquidated damages shall not exceed the amount specified in the Special Conditions of Contract. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities. Thereafter the procuring entity has the right to cancel the contract and demand all forms of damages.

10.5.2 In case of extension of the Expected Period of Completion after liquidated damages have been paid, the Engineer shall repay the overpaid amount of liquidated damages by the Contractor at the expense of next certificate of performed works.

10.6 Force majeure

10.6.1 The Contractor shall not forfeit his performance security, and shall not be responsible for payment of liquidated damages, or termination of a Contract for disregard of provision, if the delay in execution of the Contract, or default is the result of an event of force majeure.

10.6.2 For the purposes of this Clause, "force majeure" means an event beyond the control of the Contractor, not connected with error or negligence of the Contractor, and not foreseeable. Such events may include but not restricted to such actions as: wars or revolutions, fires, floods, epidemics, quarantine and embargo affecting the execution of the Works.

10.6.3 When force majeure arises, the Contractor shall promptly notify the Engineer in writing of such event and its cause. If no written instructions received from the Engineer, the Contractor shall continue to perform his obligations under the Contract as far as possible, and shall search for alternative ways of execution of the Contract, irrespective of force majeure.

10.7 Mobilization or Advance Payment

10.7.1 The Employer shall make advance payment to the Contractor in the amount and within the dates specified in the Special Conditions of Contract, provided that a Bank Guarantee for advance payment for the amount of advance have been provided by the Contractor. The Guarantee shall remain in force until the full repayment of advance; in this case the amount of the Guarantee should be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on advance payments.

10.7.2 The Contractor shall use the advance payment exclusively to pay for Plant, Machinery, and Equipment, Materials and other expenses required directly for the execution of the Contract. The Contractor shall demonstrate that advance payment has been used for the purposes of execution of the Contract by supplying copies of invoices or other documents.

10.8 Performance Security

10.8.1 Within fourteen (14) days upon receipt of notice of award, the successful Bidder shall furnish the Employer with the Performance Security, the amount and form of which is specified in the Special Conditions of Contract.

10.8.2 The Performance Security shall be returned by the Employer not later than fifteen (15) days after the date of completion by the Contractor of his obligations under the Contract, including all guarantee obligations, unless otherwise provided in the Special Conditions of Contract.

10.9 Cost of Repairs

10.9.1 Loss of or damage to the Works, Plant, or Materials included in Works and having been occurred between the Start Date and the Completion Date, including the Defects Correction Period shall be reimbursed by the Contractor at the Contractor's cost if that loss or damage arose as a result of the Contractor's action or inaction.

11 Finishing the Contract

11.1 Completion

The Contractor, after completion of all works stipulated in the Contract, shall send the Employer a notice of Completion and shall request the Engineer to issue a certificate of Completion of the Works.

11.2 Taking Over

The Employer not later than seven (7) days after the Contractor's notice, shall appoint the Working Commission to take over the Works. The Taking Over Certificate shall be prepared with participation of the Contractor. The date of approval of Taking Over Certificate by the Employer shall be deemed the Completion Date, and within seven (7) days of the date of taking over certificate, the Site and the Works should be taken over by the Employer.

11.3 Final Account

After the Certificate of Corrected Defects, the Contractor shall supply the Employer with a final account for the remaining amount that the Contractor considers payable under the Contract. Provided that all defects are corrected, and that the supplied invoice is correct and complete, the Engineer, during one month, shall certify the final certificate of performed works. If during the inspection, there will be the facts of finding a defect, and the supplied invoice is incorrect or inaccurate, the Engineer, within a month, shall submit a schedule for correction of defects. If the Final Account is still incorrect or inaccurate after it has been resubmitted, the Engineer shall determine independently the amount due to and shall decide to pay to the Contractor.

11.4 Termination

11.4.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the conditions stipulated in the Contract.

11.4.2 Fundamental breaches of the Contract conditions shall include, but shall not be limited to, the following:

(a) the Contractor stops the works for 15 days, in this case that stoppage is not provided in the current Work Execution Schedule and is not authorized by the Engineer;

(b) The Employer instructs the Contractor to suspend the progress of the works, and such instruction is not cancelled during the days specified in the Special Conditions of Contract;

(c) The Employer or the Contractor becomes bankrupt or goes into liquidation, exclusive of reorganization or amalgamation;

(d) The Employer does not pay the Contractor the amount confirmed by the Engineer within the days specified the Special Conditions of Contract of the date of invoice supplied to the Contractor for payment;

(e) the Engineer notifies and warns that non-correction of a specific defect is a fundamental breach of the Contract conditions; and the Contractor does not correct a defect within acceptable period of time established by the Engineer;

(f) The Contractor does not provide the required guarantee;

(g) The Contractor delayed the completion of the Works for a number of days correspondent to a maximum possible amount of liquidated damages as indicated in the Special Conditions of Contract.

(h) If the Contractor, in the Employer's judgment, has engaged in corrupt or fraudulent practices in the process of competitive selection or execution of the Contract.

For the purposes of this subparagraph:

(1) "corrupt practice" means the offering, giving, the agreement requesting for remuneration in any form, or services rendering in order to influence the action of a public official in the procurement process or contract execution; and

(2) "fraudulent practice" means a misrepresentation of facts in order to influence the procurement process or execution of a contract to the detriment of the Employer; including a collusive practice of bidders (prior to or after bid submission) to establish bid prices artificially at non-competitive level, and deprive the Employer from benefits of free and open competition;

(3) "collusive practice" means a scheme or arrangement between two or more contractors (subcontractors), with or without the knowledge of the Employer, designed to artificially rise the price in during the execution of a contract;

(4) "coercive practice" means harming or threatening to harm (directly or indirectly), persons or their property to influence their participation in the execution of a contract;

11.4.3 When either party of the Contract notifies the Engineer of breach for a cause other than those listed under Clause 11.4.2 above, the Engineer shall determine whether the breach is fundamental or not.

11.4.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

11.4.5 If the Contract is terminated, the Contractor shall stop the Works immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

11.5 Payment upon Termination

11.5.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue the confirmed Certificate of the performed works and Materials ordered less advance payments received up to the date of the confirmation of the certificate and less the percentage of unperformed works, as indicated in the Special Conditions of Contract. Additional Liquidated Damages shall not be charged. If the total amount due to the Employer exceeds the amount due to the Contractor, the difference shall be a debt of the Contractor to the Employer.

11.5.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer shall confirm the Certificate of the performed works, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the confirmation of the certificate.

11.6 Property

All Materials on the Site, Equipment, Temporary Structures, and Works shall be deemed the property of the Employer if the Contract is terminated because of the Contractor's fault.

11.7 Release from Performance

If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Engineer shall certify the impossibility of the Contract performance. The Contractor shall make the Site safe and stop work as quickly as possible after receiving such notice, and shall be paid for all work carried out before receiving an instruction, and for any work carried out afterwards to which a commitment was made.

11.8 Contractor to Protect Works Done, Materials and Plant

11.8.1 The Contractor should provide the protection of performed works and all materials, plant, resources and other items related to the Works from any or all kinds of damage, deterioration, destruction linked to rain, frost, fire, robbery, mysterious disappearance and other reasons. The Contractor during the execution of the works, shall additionally ensure the protection of other works on Project, and of property belonged to the Employer, and related structures from any damage, deterioration or for any other reason, including (but not limited to these) roads, buildings, warehouses and other kinds of movable and immovable property, exclusive of the event of force majeure. All costs incurred by the Contractor in view of the above-stated, shall not be subject to additional payment on the part of the Employer.

11.8.2 The Employer will not be responsible for any damage to the Contractor's works for the abovementioned reasons before they are fully completed and accepted, and the Contractor shall, without additional payment, carry out all corrections, repairs or replacements as applicable to the Works because of necessity to correct any defect, damage and other defects as a result of the above event.

11.9 Materials and Equipment of Contractor

11.9.1 The Contractor shall be responsible for the arrangement of supply, transportation, discharge and storage of all Materials and Equipment to be supplied, and delivered by the Contractor to the Project Site. The supplies shall be carried out only for the Contractor's name. The Employer shall in no case be responsible for expenses related to the supply, processing, storage and fee for stoppage of vehicle. No supplies shall be addressed to the Employer.

11.9.2 The Contractor shall provide the Employer with a Schedule of Receipt of materials and equipment on the Project Site. The sites only permitted by the Employer may be used for storage, stowage and stockpiling.

12 Special Conditions of Contract (SCC)

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict between the provisions herein and the General conditions of Contract, the Special Conditions of Contract shall prevail.

GCC Clause name	A. General
7.1	<p>The Employer is:</p> <p>Guyana Power & Light Incorporated 40 Main Street, North Cummingsburg Georgetown</p> <p>The works are:</p> <p style="padding-left: 40px;">Construction of 25 MW +/- 5% HFO-Fired Power Generation Plant Option 1 – Pln. Canefield, Canje, Berbice. Option 2 - Pln. Columbia, East Coast Demerara.</p>
7.1	The Intended Completion Date is within twelve (12) Months after the ‘Notice to Proceed’ is issued to the Contractor.
7.1	The Engineer is the Project Manager of the GPL Major Projects Department
7.1	<p>The Site is located at either:</p> <ol style="list-style-type: none"> 1. Canefield, East Canje, Berbice; or 2. Columbia, East Coast Demerara
7.1	The Start Date shall be 7 days after the “Notice to Proceed” is issued to the Contractor.
7.3	The Language of Contract is English

7.3	The Applicable Law for this contract is The Laws of Guyana
7.10.1	The minimum insurance amounts and deductibles shall include but not limited to; (a) For the Works, Plant and Materials; (b) For the loss or damage to Equipment; (c) For loss or damage to property (except the Works, Plant Materials and equipment) in connection with the Contract; (d) For personal injury or death: (i)Of the Contractor’s employees: (ii)Of other people:
14.1	The safeguard/ safety at the site, The Contractor shall; 1. Provide safety gear which should be worn by workers whilst works are ongoing. 2. Agree to abide with GPL safety plan for works on site as such the Contractor will be responsible for obtaining a copy from GPL Inc.
16.2	The date by which the Site has been transmitted to Contractor for use shall be the same date as the “Notice to Proceed”
19.0	Disputes or disagreement arising between the Employer and the Contractor shall be settled in accordance with the Laws of Guyana.
B. Time Control	
8.1.1	The Contractor shall submit for approval a Work Program within seven (7) days from the date of the Letter of Acceptance.
8.1.2	The period of submission of updated Work Program – within seven (7) days of request by Engineer.
8.1.3	The retention for untimely submission of Work Program is US\$100 per day.
C. Quality Control	
9.1.2	The Defects Liability Period is Twelve (12) Months

9.3.1	Any correction of Defects must commence within fourteen (14) days of receipt of Engineer's notice.
D. Cost Control	
10.3.1	The Employer shall pay the Contractor sums according to certificates of milestone achievements confirmed by the Engineer during 28 days after the date of invoicing pursuant to the certificate of milestone achievements. The Employer shall pay a rate of 0.02% interest for certificates of milestone achievements when a payment is delayed without reasonable cause.
10.4.1	Retention The retention amount shall be 5% of the Contract Sum.
10.5.1	Liquidated Damages The penalty to be paid by the Contractor for delay of the completion of works is 0.5% per day to a maximum of 15% of the Contract Sum.
10.7.1	Mobilization/ Advance Payment The time frame by which mobilization/advance payment is to be provided is within fourteen (14) days after the signing of the contract. The amount is 15% of the contract sum and to be submitted in the form of a Bank Guarantee or a bond from an Insurance Company licensed by the Bank of Guyana.
10.8.1	The amount of Performance Security shall be 10% of Bid Price , and in the form of a Bank Guarantee or a bond from an Insurance Company licensed by the Bank of Guyana.
E. Finishing the Contract	
11.4.2	When a suspension order is not revoked by the Employer after 30 days
11.4.2	When payment to the Contractor is delayed beyond 30 days following invoicing
11.4.2	The maximum number of days of delay is: 30 days; consistent with clause 11.4 on liquidated damages.

PAYMENT SCHEDULE

Progressive Payments to Contractor shall be made for the activities as stated in tables below to the extent of weightings mentioned against each on basis of the prices quoted for the Substations and Transmission Lines

Stage	Description of Milestones for each Substation	Documents to be Presented	% Accepted Contract Amount for each Substation
1	Advance Payment	Contractor's written request and Advance Payment guarantee. The Advance Guarantee shall be in the form of a Bank Guarantee or a bond from an Insurance Company licensed by the Bank of Guyana.	15
2	Approval of basic design by the Engineer	Notice of the Engineer's Approval	5
3	Shipment of major equipment	Interim Payment Certificate (upon the submission of Shipping documents; BL etc.)	40
4	Arrival of major equipment	Interim Payment Certificate (Verification of delivery to Site)	10
5	Completion of foundation	Interim Payment Certificate (certified complete by Engineer)	10
6	Completion of Works	Interim Payment Certificate (certified complete by Engineer).	10
7	Taking – over of Works	Taking-over Certificate issued by the Employer	7.5
8	Completion of Outstanding Works, (remedying of defects)	Certificate issued by the Engineer	2.5

CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION
PLANT GPL-PD-063-2022

13 LETTER OF TECHNICAL BID & SCHEDULES TO BID

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13.1 Letter of Technical Bid

Schedules to Bid

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Schedule F: Works to be performed by Subcontractors

Schedule G: Deviations from Technical & Contractual Conditions

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Schedule I: Past Performance and Present Commitments

13.2 LETTER OF TECHNICAL BID
(LETTER OF BID)

Bid Reference No. _____

CONSTRUCTION OF 25 MW +/- 5% HFO-FIRED POWER GENERATION PLANT.

Design, Manufacturing, Inspection, Supply, Installation, Testing & Commissioning of 25 MW ±5% HFO Fired Power Generation Plant at either (1) Canefield, Canje, Berbice or (2) Columbia East Coast Demerara.

To:

Board of Directors
Guyana Power & Light Inc.
Georgetown, Guyana

Dear Directors,

1. Having examined the Bidding Documents including Instructions to Bidders, Conditions of Contract, Specifications, Drawings, Schedule of Prices and Addenda Nos. _____ for the execution of the above-named Works, we, the undersigned, being a company doing business under the name of and address _____ and being duly incorporated under the laws of _____ hereby offer to execute and complete such Works and remedy any defects therein in conformity with the said Documents including Addenda thereto.
2. We understand that all the Schedules attached hereto form part of this Bid.
3. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a Bid Security in the amount of _____ drawn in your favour or made payable to you and valid for a period twenty eight (28) days beyond the period of validity of Bid.

4. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the whole of the Works comprised in the Contract within the time(s) stated in Preamble to the Conditions of Contract.

5. We agree to abide by this Bid for the period of _____ days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

6. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

7. We undertake, if our Bid is accepted, to execute the Performance Security referred to in Sub-Clause 10.8.1 of Conditions of Contract for the due performance of the Contract.

8. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a Bid for the Works.

9. We do hereby declare that our firm, including any subcontractors or suppliers for any part of the Contract, have nationalities from eligible countries *[insert the nationality of the Bidder, including that of all parties that comprise the Bidder if the Bidder is a consortium or association, and the nationality of each Subcontractor and Supplier]*.

10. We, including any subcontractors or suppliers for any part of the Contract, do not have any conflict of interest.

11. We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process.

12. We confirm, if our Bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the execution of the Contract and the composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer. (Please delete in case of Bid from a single firm).

Dated this day of 200...

Signature in the capacity of duly authorized to sign the Bid for and on behalf of

(Name of Bidder in Block Capitals) (Seal of Bidder)

Bidder's Address

.....
.....
.....

Witness:

Signature: Name:
.....

Address:

.....
.....
.....

Occupation

13.3 SCHEDULES TO BID

13.3.1 SCHEDULE –A: SPECIFIC WORKS DATA

The main technical data is prescribed in the relevant sections of the Employer’s Requirements. However, the Bidder may supplement the main technical data by providing hereunder other salient parameters including main plant make, capacity and suitability for the works under consideration to enable the Employer/Project Manager/Engineer to assess technical conformance of the proposed process and the means available with the contractor to do it.

Initials of Signatory to Bid:.....

13.3.2 SCHEDULE - B: PROJECT MANAGEMENT PLAN

The Bidder shall provide in this Schedule, Project Management Plan including subsidiary Management Plans as the instrument to guide both project execution and project control.

Initials of Signatory to Bid:.....

13.3.3 SCHEDULE – C: METHOD OF PERFORMING THE WORKS

The Bidder is required to submit a narrative outlining the method of performing the Works. The narrative should indicate in detail and include but not be limited to:

- The sequence and methods in which bidder proposes to carry out the Works, including the number of shifts per day and hours per shift.
- A list of all major items of constructional and erection plant, tools and vehicles proposed to be used in carrying out the Works at Site, including number of each kind, make, type, capacity of all equipment, working condition, which shall be deployed by the Bidder for Civil Work and Erection, Testing and Commissioning of the Works, in sufficient detail to demonstrate fully that the equipment will meet all the requirements of the Specifications.
- The procedure for installation/erection of equipment and transportation of equipment and materials to the site.
- Details regarding mobilization in Guyana, the type of facilities including personnel accommodation, office accommodation, provision for maintenance and for storage, communications, security and other services to be used.
- The Bidder shall provide description of the construction site facilities.
- The Bidder shall be responsible for pumps, electrical power, water and electrical distribution systems, and sewerage system including all fittings, pipes and other items necessary for servicing the Contractor's construction site facilities. The Bidder shall list or explain the plans for providing these facilities for the service of the Contract as follows:
 1. Provision of Services.
 - a) Power (expected power load, etc.).
 - b) Water (required amount and system proposed).
 - c) Sanitation (sewage disposal system, etc.).
 2. Construction of Facilities
 - a) Contractor's Office, Workshop and Work Areas (areas required and proposed layout, type of construction of buildings, etc.).
 - b) Warehouses and Storage Areas (area required, type of construction and layout).
 3. Construction Equipment Assembly and Preparation (detailed plans for carrying out this activity).
 4. Other Items Proposed (Security services, etc.).

13.3.4 SCHEDULE – D: PROPOSED PROGRAM OFWORKS

Bidder shall provide a program in a MS Project 2016 format for the entire Scope of Works. While Bidder shall provide a master schedule for the contract, Bidder shall provide a schedule for each phase.

Initials of Signatory to Bid:.....

13.3.5 SCHEDULE – E: TECHNICAL PROPOSAL

Complete Technical details of the materials and equipment specifications with catalog.

Bidder shall provide complete technical details of the materials and equipment specifications with catalog for all work items of the entire Contract. The details shall include materials and equipment for construction and finished plant including spares and consumables.

Note: Attach additional sheets, if necessary

Initials of Signatory to Bid:.....

13.3.6 SCHEDULE – F: SUBCONTRACTED WORKS

Work to be performed by subcontractors. The Bidder will do the work with its own forces except the part (s) of the Works listed below which it intends to sub-contract.

Items of Works to be Subcontracted	Name and Address of Sub-Contractor	Statement of similar works previously executed (Attach evidence)
------------------------------------	------------------------------------	--

Note:

1. No change of Sub-Contractor shall be made by the Bidder without prior approval of the Employer.
2. The truthfulness and accuracy of the statement as to the experience of Subcontractors is guaranteed by the Bidder. The Employer’s judgment shall be final as to the evaluation of the experience of Subcontractors submitted by the Bidder.
3. Statement of similar works shall include description, location & value of work, year completed and name & address of the clients.
4. This may include manufacturer(s) who are proposed here and their relevant details to be provided accordingly including make, capacity and salient features to make it particularly suitable for the works. The technology used should also be detailed adequately.

13.3.7 SCHEDULE – G: DEVIATIONS

DEVIATIONS FROM TECHNICAL & CONTRACTURAL PROVISIONS

It is presumed that the Bidder shall not take any deviation. However, if he intends to take deviations to the specified technical provisions, those must be listed in the space provided below:

Sr. No.	Clause No. / Section No.	Deviations/Clarifications
---------	--------------------------	---------------------------

Note: Attach additional sheets, if necessary

Initials of Signatory to Bid:.....

13.3.8 SCHEDULE – H: JV AGREEMENT

(In the event that the successful Bidder is a joint venture formed of two or more companies, the Employer requires that the parties to the joint venture accept joint and several liabilities for all obligations under the Contract.)

13.3.9 SCHEDULE – I: PROJECTS

PAST PERFORMANCE AND PRESENT COMMITMENTS

Past Performance

Sr. No.	Name of Project(s)	Name of Employer	Completed Cost	Start Date	Planned Completion Date	Actual Completion Date	Satisfactory Performance Certificate from Employer / Remarks regarding delays if applicable
1.							
2.							
3.							
4.							
5.							
6.							
7.							

Present Commitments

Sr. No.	Name of Ongoing Project(s)	Name of Employer	Total Cost	Start Date	Planned Completion Date	% of Works Completed	Award letter / Remarks regarding delays if applicable
1.							
2.							
3.							
4.							
5.							
6.							
7.							

14 FORM OF PRICE BID AND SCHEDULES TO BID

Form of Bid

Schedule to Bid

Schedule J to Bid: Integrity Pact

14.1 FORM OF PRICE BID
(LETTER OF BID)

Bid Reference No. _____ Option

CONSTRUCTION OF 25 MW +/- 5% HFO-FIRED POWER GENERATION PLANT

Design, Inspection, Supply, Installation, Testing & Commissioning of 25 MW ±5% HFO
Fired Power Plant .

To:

Board of Directors
Guyana Power & Light Inc.
Georgetown, Guyana

Dear Directors,

13. Having examined the Bidding Documents including Instructions to Bidders, Conditions of Contract, Specifications, Drawings, Schedule of Prices and Addenda Nos. _____ for the execution of the above-named Works, we, the undersigned, being a company doing business under the name of and address

_____ and being duly incorporated under the laws of _____ hereby offer to execute and complete such Works and remedy any defects therein in conformity with the said Documents including Addenda thereto for the Total Bid Price comprising USD _____ (_____) or such other sum as may be ascertained in accordance with the said Documents.

14. Should this Bid be accepted by you, we propose to send representative(s) having our Power of Attorney to Georgetown, Guyana within ten (10) days following receipt of your written acceptance of this Bid for the purpose of executing a

Contract Agreement in the form set out in the Contract Documents, including such alterations or additions thereto as you may require to adopt for such agreement to the circumstances of this Bid.

15. We understand that all the Schedules attached hereto form part of this Bid.
16. As security for due performance of the undertakings and obligations of this Bid, we submit herewith a Bid Security in the amount of _____ drawn in your favour or made payable to you and valid for a period twenty eight (28) days beyond the period of validity of Bid.
17. We undertake, if our Bid is accepted, to commence the Works and to deliver and complete the whole of the Works comprised in the Contract within the time(s) stated in Preamble to the Conditions of Contract.
18. We agree to abide by this Bid for the period of _____ days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
19. Unless and until a formal Agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
20. We undertake, if our Bid is accepted, to execute the Performance Security referred to in Sub-Clause 10.8.1 of Conditions of Contract for the due performance of the Contract.
21. We understand that you are not bound to accept the lowest or any Bid you may receive.
22. We do hereby declare that the Bid is made without any collusion, comparison of figures or arrangement with any other person or persons making a Bid for the Works.
23. We confirm, if our Bid is accepted, that all partners of the joint venture shall be liable jointly and severally for the execution of the Contract and the composition or

the constitution of the joint venture shall not be altered without the prior consent of the Employer. (Please delete in case of Bid from a single firm).

Dated this _____ day of _____ 20_____

Signature _____ in the capacity of _____ duly

authorized to sign bids for and on behalf of _____

(Name of Bidder in Block Capitals)

(Seal)

Address

Witness:

(Signature) _____

(Name) _____

Address: _____

Occupation _____

14.1.1 SCHEDULE – J: INTEGRITY PACT

Contract No. _____ Dated _____

Contract Value: _____

Contract Title: _____

..... hereby declares that it has not obtained or induced the procurement of any contract, right, interest, privilege or other obligation or benefit from Guyana Power & Light Inc. (GPL) or any department thereof through any corrupt business practice.

Without limiting the generality of the foregoing, represents and warrants that it has fully declared the brokerage, commission, fees etc. paid or payable to anyone and not given or agreed to give and shall not give or agree to give to anyone within or outside Guyana either directly or indirectly through any natural or juridical person, including its affiliate, agent, associate, broker, consultant, director, promoter, shareholder, sponsor or subsidiary, any commission, gratification, bribe, finder's fee or kickback, whether described as consultation fee or otherwise, with the object of obtaining or inducing the procurement of a contract, right, interest, privilege or other obligation or benefit in whatsoever form from GPL, except that which has been expressly declared pursuant hereto.

..... certifies that it has made and will make full disclosure of all agreements and arrangements with all persons in respect of or related to the transaction with GPL and has not taken any action or will not take any action to circumvent the above declaration, representation or warranty.

..... accepts full responsibility and strict liability for making any false declaration, not making full disclosure, misrepresenting facts or taking any action likely to defeat the purpose of this declaration, representation and warranty. It agrees that any contract, right, interest, privilege or other obligation or benefit obtained or procured as aforesaid shall, without prejudice to any other rights and remedies available to GPL under any law, contract or other instrument, be voidable at the option of GPL.

Notwithstanding any rights and remedies exercised by GPL in this regard, agrees to indemnify GPL for any loss or

damage incurred by it on account of its corrupt business practices and further pay compensation to GPL in an amount equivalent to ten time the sum of any commission, gratification, bribe, finder's fee or kickback given by as aforesaid for the purpose of obtaining or inducing the procurement of any contract, right, interest, privilege or other obligation or benefit in whatsoever form from GPL.

GPL:

Name of Contractor:

Signature:

Signature:

[Seal]

[Seal]

15 SCHEDULE OF RATES / SCHEDULE OF PRICES

15.1 PREAMBLE TO SCHEDULE OF PRICES

15.1.1 General

15.1.1.1 The Schedule of Prices shall be read in conjunction with the Conditions of Contract together with the Specifications and Drawings.

15.1.1.2 The Contract shall be for the whole of the Works as described in these Bidding Documents. Bids must be for the complete scope of Work.

15.1.2 Description

15.1.2.1 The general directions and descriptions of work and materials are not necessarily repeated nor summarized in the Schedule of Prices. References to the relevant sections of the Bidding Documents shall be made before entering prices against each item in the Schedule of Prices.

15.1.2.2 The quantities shown in the Schedule of Prices are estimated quantities only as an indication of the Scope of Work to enable the bidder to bid for different items of the Works for his estimate of costs. The estimated quantities shall be used for comparing the bids. It is, however, to be noted that in the event of any increase or decrease in the quantity of any item of Works and subject to provisions of the Conditions of Contract herein, the actual quantities executed will be paid.

15.1.3 Units & Abbreviations

15.1.3.1 Units of measurement, symbols and abbreviations expressed in the Bidding Documents shall comply with the Systeme Internationale d' Unites (SI Units).

15.1.3.2 The following abbreviations shall be used in the Schedule of Prices:

	<u>Abbreviation</u>
United States Dollars	US\$
Guyana Dollars	GUY\$
Number	No.
Kilometer	km
Kilogram	Kg
Cubic Meter	Cu m
Square Meter	Sq m
Provisional Sum	PS
Percent	%

15.1.4 Rates and Prices

- 15.1.4.1 Except as otherwise expressly provided under the Conditions of Contract, the rates and amounts entered in the Schedule of Prices shall be the rates at which the Contractor shall be paid and shall be the full inclusive value of the work set forth or implied in the Contract; except for the amounts reimbursable to the Contractor under the Contract.
- 15.1.4.2 Unless otherwise stipulated in the Conditions of Contract, the rates and prices entered by the bidder shall not be subject to adjustment during the performance of the Contract.
- 15.1.4.3 All duties, taxes and other levies payable by the Contractor under the Contract, or for any other cause, as on the date twenty eight (28) days prior to the deadline for submission of bids shall be included in the rates and prices and the total Bid Price submitted by a bidder.
- 1.1.1. Additional/reduced duties, taxes and levies due to subsequent additions or changes in legislation shall be reimbursed / deducted as per provisions of the Conditions of Contract.
- 15.1.4.4 The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Schedule of Prices, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related items of the Works and no separate payment will be made for those items.
- 1.1.2. The rates, prices and amounts shall be entered against each item in the Schedule of Prices. Any item against which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates and prices for other items in the Schedule of Prices.
- 15.1.4.5 The bidder shall be deemed to have obtained all information as to port clearance facilities and charges, loading and unloading facilities and charges, storage facilities and charges, transportation facilities and charges, congestion and/or other conditions to be expected at Georgetown Port and or any other seaport of Guyana and all requirements related thereto.
- 1.1.3. The Contractor shall be responsible to make complete arrangements for the transportation of the Plant to the Site.
- 1.1.4. The bidder shall be deemed to have included all clearing, forwarding and other incidental costs in this regard in his bid. The Contractor will have the option to use either Georgetown Port or any other seaport of Guyana.
- 15.1.4.6 The Contractor shall provide for all parts of the Works to be completed in every respect for commercial operation. Notwithstanding that any details, accessories, etc. required for the complete installation and satisfactory operation of the Substation and Transmission System, are not specifically mentioned in the Specifications, such details shall be considered as included in the Contract Price.

15.1.5 Bid Prices

15.1.5.1 Break-up of Bid Prices

The various elements of Bid Prices shall be quoted as detailed below:

1.1.1. FOB Port of Shipment

The bidder shall quote prices for FOB Port of Shipment for all individual items and for each sub-total of Plant, Erection Equipment and Spare Parts to be supplied from outside Guyana on FOB (Port of Shipment) basis. The FOB Port of Shipment price shall include the cost of the following:

- a) Design, manufacture, finishing, factory testing, packing for transport and all transportation costs incurred in placing the Plant, Erection Equipment and Spare Parts and other materials on board the vessel.
- b) Provision of clean on-board bills of lading.
- c) Export taxes, fees or charges levied on exporting Plant, Erection Equipment and Spare Parts and other materials in the country of origin, in the case of Plant imported to Guyana.
- d) Provision of certificates of origin, consular invoices (if required) or any other documents issued in the country of origin.

15.1.5.2 Insurance & Shipping

a) Insurance

- i. The bidder shall quote prices for insurance cover from ex-factory/ ex-works to the Site for the sub-totals of the Plant, Erection Equipment, Spare Parts and other materials to be imported for the Contract. Such prices shall include all insurance costs covering the responsibility for all loss or damages while loading, unloading, storing and trimming on board or on inland carrier and transportation to Site.
- ii. The prices for transportation/marine insurance cover shall be quoted on the basis of insurance through insurers from any country(ies) of the world acceptable to the Employer.

b) Shipping

- i. The bidder shall quote prices for shipping from port of shipment to the port of entry in Guyana for the sub-totals of the Plant, Erection Equipment, Spare Parts and other materials to be imported for the Contract in Guyana. Such prices shall include all marine transportation costs including ocean freight and other charges, etc.

- ii. The prices for shipping/marine transportation shall be quoted for shipment through reputed shipping lines currently operating in Guyana.
- iii. Cost of shipment(s) effected by the Contractor at his option by aircraft shall be deemed to be included in the Total Bid Price.

15.1.5.3 CIF (Guyana Seaport) Price

CIF (Guyana Seaports) price will be the total of FOB price, insurance and shipping prices, described here above.

15.1.5.4 Customs Duties

Equipment and materials for the contract shall be duty free.

15.1.5.5 DDP (Guyana Seaport) Price

DDP (Guyana Seaport) price will be the total of CIF price and customs duties, described here above.

15.1.5.6 Ex-factory Price for Local Goods

The bidder shall quote prices for Local Goods, materials (other than materials required for civil works such as concrete and reinforcement etc. Cost of which will be included in the price of civil works) and equipment in the relevant column of Ex-Factory (Guyana) of "Schedule of Prices". Such prices shall include:

- a) Design documentation, drawings, drafting, planning services, manufacturing, testing and packing of finished goods ready for delivery to Site.
- b) All custom duties, sales tax and other taxes already paid or payable on the components and raw materials used in the manufacture or assembly of Local Goods, materials and equipment.

15.1.5.7 Insurance of Local Goods

Insurance of Local Goods and other materials from factory to Site shall include all insurance costs covering the responsibility of all losses or damages, while loading, unloading, storing, trimming on the carrier and transporting to Site. Checking and verifying of consignments, issuance of receiving reports and damage reports (when applicable) shall be the Contractor's responsibility. The cost of insurance shall be quoted on the basis of insurance through any insurance company operating in Guyana and acceptable to the Employer.

15.1.5.8 Local Transport

Inland transportation for the Plant, Erection Equipment and Spare Parts shall be the Contractor's responsibility in respect of:

- a) the Plant, Erection Equipment, Spare Parts and other materials offered from outside Guyana; from the port of entry in Guyana to the storage area at the Site, and
- b) indigenous Plant, Erection Equipment, Spare Parts and other materials if any, offered from within Guyana; from the factory in Guyana to the storage area at the Site, and
- c) all charges occurring therefrom including taxes, fees etc. and charges for loading, forwarding and unloading expenses shall be borne by the Contractor. Unloading at the Site, handling of the Plant, Erection Equipment, Spare Parts and other materials to the designated point of Site storage, checking and verifying all shipments received against shipping documents, issue of all receiving reports and issues of damage reports (when applicable) shall be the Contractor's responsibility.
- d) The bidder shall recognize such elements of the costs which he expects to incur in the performance of the Works and shall include all such costs in the rates and amounts entered in the Schedule of Prices.

15.1.5.9 Erection & Other Work

The bidder shall quote prices for Erection & Other Work for the sub-totals of the Plant at the Site. Such prices shall include the costs of handling of the Plant and other materials from Site storage to point of final installation, erection, installation, testing, commissioning including all inspection, reliability tests, the cost of foreign and local erection staff and labor, tools and equipment, etc. It shall also cover the services of qualified representative(s) of the supplier(s) of Plant or adviser(s) to assure proper erection and commissioning of the Plant. The price shall also include cost of arranging insurances in respect of Contractor's operations in Guyana which insurances shall be effected by the Contractor with the National Insurance Scheme (NIS) of Guyana and any other insurance company operating in Guyana and acceptable to the Employer.

15.1.5.10 Total Bid Price

The total of bid prices in the Schedule of Prices shall be entered in the Summary of Bid Prices. The unit rates and prices and lump sum amount entered in the Schedule of Prices will be the rates at which the Contractor will be paid, and shall be deemed to be the full inclusive value of the work including all costs of performing the Works such as overheads, income tax, super tax, profits, costs of accepting the general risks, liabilities and obligations set forth or implied in the Contract

except for the amounts reimbursable, if any, to the Contractor under the Contract. The rates shall also include Contractor's cost for providing Performance Security and other Bank Guarantees required for performance of the Contract.

1. Erection and Testing Equipment and Maintenance Tools

15.1.5.11 In the Schedule of Prices, under Erection and Testing Equipment & maintenance tools the Employer has drawn up a list of Erection and Testing Equipment and Maintenance Tools along with estimated quantities. The bidder shall enter the price only in FOB price column for all individual items and shall give the break-up of the prices into FOB Port of Shipment, Shipping to wharf at the port of entry in Guyana, Insurance to Site and Local Transport in Guyana against each sub-total. These Erection and Testing Equipment and Maintenance Tools shall be furnished and the cost included in the Bid Price.

1.1.1. The Employer shall have the option of ordering additional quantities of these essential Erection and Testing Equipment and Maintenance Tools, at the unit rates entered in the Schedule of Prices no later than one year after the Commencement Date.

1.1.2. The unit rate for any item shall be computed by dividing the total amount by the quantity of that item.

15.1.5.12 The bidder shall also list, in the space provided in the Schedule of Prices, Additional Recommended Erection and Testing Equipment and Maintenance Tools, any Erection and Testing Equipment and Maintenance Tools which he recommends be provided for the Works, in addition to those already specified by the Employer in the Schedule of Prices. The bidder shall enter against each such item, its recommended quantity, and price. The cost of such Additional Recommended Erection and Testing Equipment and Maintenance Tools will not be taken into account in the evaluation of bids.

15.1.5.13 The Additional Recommended Erection and Testing Equipment and Maintenance Tools may be selected by the Engineer/Employer and the Contract Price will be adjusted in accordance with the prices set against those items in the Schedule of Prices.

1. Spare Parts

1.1. In the Schedule of Prices, under Spare Parts, the Employer has drawn up a list of spare parts along with estimated quantities. The bidder shall enter the price only in FOB price column for all individual items and shall indicate the break-up of price into FOB Port of Shipment, Shipping to wharf at the port of entry in Guyana, Insurance to Site and Local Transport in Guyana against each sub-total. These spare parts shall be furnished and the cost included in the Bid Price.

1.1.1. The successful Bidder shall prepare and at the time of preparation of Letter of Acceptance submit to the Employer the unit rates of all individual items of the spare parts. The unit rates of the spare parts for the required quantities

shall give a total cost equal to the amount entered in the Schedule of Price for spare parts.

1.1.2. The Employer shall have the option of ordering additional quantities of these essential spare parts, at the unit rates entered in the Schedule of Prices, no later than one year after the Commencement Date.

1.1.3. The unit rate for any item shall be computed by dividing the total amount by the quantity of that item.

1.2. The Bidder shall also list in the space provided in the Schedule of Prices any Spare Parts which he recommends be provided for the Works, in addition to those specified by the Employer in the Schedule of Prices. The Bidder shall enter against each such item, its recommended quantity, rate and price. The cost of such Additional Recommended Spare Parts will not be considered in the evaluation of bids.

1.2.1. The Additional Recommended Spare Parts may be selected by the Engineer/ Employer and the Contract Price will be adjusted in accordance with the prices set against those items in the Schedule of Prices.

1. Reimbursable Costs

15.1.5.14 If provided in the Particular Conditions of Contract, the Contractor shall be reimbursed the actual amounts (without any overhead charges and profits) disbursed by him in respect of non-exempt Guyanese customs, import duties, and taxes, levied upon Plant, Erection Equipment and Spare Parts imported directly by him or his subcontractors into Guyana for the purpose of this Contract for incorporation in the Works.

15.1.5.15 The bidder shall recognize such elements of the costs which he expects to incur in the performance of the Works and which are reimbursable, and he shall not include any such costs in the rates and amounts entered in the Schedule of Prices.

15.1.6 Provisional Sums

Provisional Sums included and so designated in the Schedule of Prices if any, shall be expended in whole or in part at the direction and discretion of the Employer/ Engineer. The Contractor will only receive payment in respect of Provisional Sums if he has been instructed by the Employer/Engineer to utilize such sums.

16 DAYWORK SCHEDULE

16.1 General

Work shall not be executed on a Daywork basis except by written Order of the Project Manager. The rates for Daywork items entered in the Schedule of Prices shall apply to any quantity of Daywork ordered by the Project Manager.

16.2 Daywork - Labor

- 1.1. In calculating payments due to the Contractor for the execution of Daywork, the hours for labour shall be reckoned from the time of arrival of the labour at the job Site to execute the particular item of Daywork to the time of departure, but excluding meal breaks and rest periods. Only the times of classes of labour directly doing work ordered by the PM and for which they are competent to perform shall be measured.
- 1.2. The time of Plant Erectors or other expatriate supervisory personnel shall not be measured unless their time on Site is extended by Variation Order. The rates entered by the Bidder for these categories shall be daily rates inclusive of all allowances and overheads.
- 1.3. For labour other than Plant Erectors or other expatriate supervisory personnel, the Contractor shall be entitled to payment in respect of the total time that labour is employed on Daywork, calculated at the basic rates entered by him in the Schedule of "Daywork Rates – Labour" together with an additional percentage payments on basic rates representing the Contractor's profit, overheads, etc., as described below:
 - 1.3.1. The basic rates for labour shall cover all direct costs to the Contractor, including (but not limited to) the amount of wages paid to such labour, transportation time, overtime, subsistence allowances and any sums paid to or on behalf of such labour for social benefits in accordance with Guyana Labour laws. The basic rates will be payable in Guyana dollars only, and
 - 1.3.2. The additional percentage payment to be quoted by the Bidder and applied to costs shall be deemed to cover the Contractor's overheads, profits, superintendence, liabilities and insurances and allowances to labour, timekeeping and clerical and office work, the use of consumable stores, water, lighting and power; the use and repair of staging, scaffolding, workshops and stores, portable power tools, manual plant and tools; supervision by the Contractor's staff, foremen and other supervisory personnel; and charges incidental to the foregoing. Payments under this item shall be made in foreign currency and local currency at the percentages entered in the Daywork Schedule.

- 1.3.3. Rates entered in the Daywork Schedule shall apply to labour of trade and qualification as described and to labour of other trades with similar skill and qualification.

16.3 Daywork - Contractor's Equipment

- 1.4. The Contractor shall be entitled to payments in respect of Contractor's Equipment already on Site and employed on Daywork at the basic rental rates entered by him in the "Schedule of Daywork Rate - Contractor's Equipment". The said rates shall be deemed to include complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricants and other consumables and all overheads, profit and administrative costs related to the use of such equipment.
- 1.5. In calculating the payment due to the Contractor for Contractor's Equipment employed on Daywork, only the actual number of working hours will be eligible for payment, except that, where applicable and agreed with the Engineer, the travelling time from the part of the Site where the Contractor's Equipment was located when ordered by the Engineer to be employed on Daywork and the time for the return journey thereto shall be included for payment.
- 1.6. The rental rates for Contractor's Equipment employed on Daywork shall be stated in Guyana Dollars but payments to the Contractor will be made in local and foreign currencies according to the rates entered in the Schedule.

16.4 Daywork-Materials

- 1.7. The Contractor shall be entitled to the following payments in respect of materials used for Daywork (except for materials for which the cost is included in the percentage addition to labour costs) which are actually incorporated into the Works:
- 1.8. The net cost of such materials delivered to warehouse or work yard area or storage area at the Site. Such cost shall be calculated by the Contractor on the basis of the invoiced price and freight and insurance as certified by the Engineer on the basis of invoices produced.

Percentage addition, in local and/or foreign currency, of such net cost of materials to cover the Contractor's handling charges, overheads and profits.

- 1.9. Payment of the net cost to the Contractor of Daywork materials shall be made in the same currency as the invoice. Payment of the addition for handling charges, overheads and profit shall be in local and/or foreign currency as entered in the Schedule of Daywork - Materials.

17 SCHEDULE OF PRICES

17.1 SCHEDULE – 1: SUMMARY OF BID PRICES

Item No.	Description	TOTAL PRICE U.S. \$
1	Plant (Including Mandatory Spare Parts) (Sch. 2)	
2	Installation and Commissioning (Sch. 3)	
3	Civil and Building Works (Sch. 4)	
4	Services (Sch. 5)	
5	Provisional Sum	
TOTAL		
Total Bid Price (The amount to be entered in Paragraph 1 of the Form of Bid) (In Words)		

17.2 INLAND TRANSPORTATION

- Option 1 – Pln. Canefield
- Inland transportation involves transportation by barge from Port Georgetown to a landing facility on the Canje River a distance of approximately 107km; then by road to Canefield.
 - Regular transportation from Port Georgetown is by Road from Port Georgetown to Canefield
- The route from Georgetown to Canefield involves crossing the Berbice Bridge (<http://www.berbicebridge.com/>). The bridge has daily openings lasting approximately ninety minutes according to schedule. The Bridge also has weight restrictions, currently set at 18 tons for crossing. Special crossing requires a minimum of 1 days' notice and will have to be scheduled by the Bridge Management.

- Option 2 – Pln. Columbia
- Inland transportation involves transportation by road from Port Georgetown to Pln. Columbia a distance of approximately 43km.

17.3 SCHEDULE – 2: PLANT

The Bid shall fill up the following table of prices and shall include the same in the financial proposal

This list is not exhaustive. Bidders may identify items as not applicable (N/A) or add items as deemed necessary.

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)									
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)
17.4 A - POWER GENERATION												
17.4.1 A.1 - GENERATING SET												
A1.1	ENGINE	1 lot										
A1.2	GENERATOR	1 lot										

A1.3	BASE FRAME including Common base frame engine part Common base frame generator part Fastening equipment (set)	1 lot										
A1.4	ELASTIC MOUNTING Steel springs (set)	1 lot										
A1.5	COUPLING Flexible coupling	1 lot										
A1.6	CONNECTIONS Flexible connections between engine and external piping <ul style="list-style-type: none"> • Flexible hoses and gaskets (set) • Cooling water bellows (set) • Exhaust gas bellows • Charge air bellows compensator 	1 lot										
A1.7	PLATFORMS Engine maintenance platform prefabricated	1 lot										

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)											
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation		TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)		
17.4.2	A.2 - MECHANICAL AUXILIARY SYSTEMS													
A2.1	AUXILIARY MODULES ➤ Engine Auxiliary module with integrated compact booster including ➤ Fuel oil filter ➤ Fuel Booster pump ➤ Return fuel pump ➤ Fuel oil cooler ➤ Return fuel tank ➤ Lubricating oil automatic filter ➤ Lubricating oil cooler ➤ Pre lubricating oil pump ➤ Pre heating unit	1 lot												

	<ul style="list-style-type: none"> ➤ Thermostatic valve lubricating oil back-up cooler ➤ Thermostatic valve high temperature water system ➤ Thermostatic valve low temperature water system ➤ Pressure increasing water pump ➤ Steam heater ➤ Piping and insulation ➤ Valves and gauges ➤ Module control panel 												
A2.2	<p>EXHAUST GAS MODULE</p> <ul style="list-style-type: none"> ➤ Low temperature expansion tank ➤ Charge air silencer ➤ Exhaust gas branch pipe ➤ Piping and insulation ➤ Oil mist separator 	1 lot											
A2.3	Pipe Rack	1 lot											

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)										
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)	
17.4.3	A.3 - FUEL SYSTEM												
A3.1	LIGHT FUEL OIL SYSTEM (LFO) <ul style="list-style-type: none"> ➤ LFO unloading pump unit ➤ LFO transfer pump unit ➤ Day tank equipment ➤ Piping and valves for LFO system inside and outside engine hall 	1 lot											
A3.2	HEAVY FUEL OIL SYSTEM <ul style="list-style-type: none"> ➤ HFO transfer pump unit ➤ HFO buffer tank insulation and tank equipment ➤ HFO separator unit 	1 lot											

	<ul style="list-style-type: none"> ➤ Separator, Delivery pump, Strainer, Steam heater, Sludge tank and sludge pump, Steel frame, Control panel, Interconnection pipes, flanges, seals and valves ➤ Heavy/ light fuel oil feeder unit ➤ Heavy fuel oil feeder pump ➤ Light fuel oil feeder pump ➤ Automatic filter ➤ Manual by-pass filter ➤ Viscosity control system ➤ Piping and valves heavy fuel oil system inside engine hall ➤ HFO trace heating material and pipe insulation inside and outside engine hall 												
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Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)									
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)
17.4.4	A.4 - STATION SUPPORT SYSTEM											
A.4.1	LUBRICATING OIL SYSTEM (LO) including <ul style="list-style-type: none"> ➤ LO separator unit ➤ LO unloading pump unit: fresh oil ➤ LO storage tank: fresh oil ➤ Equipment for lubricating oil storage tank: fresh oil ➤ LO service tank ➤ LO service tank equipment ➤ LO pump unit (mobile) ➤ LO transfer pump unit (stationery) ➤ LO storage tank : used oil 	1 lot										

	<ul style="list-style-type: none"> ➤ LO unloading pump unit: used oil ➤ Equipment for lubricating oil storage tank: used oil ➤ Piping and valves lubricating oil system inside engine hall ➤ LO system pipe insulation inside engine hall ➤ Piping and valves lubricating oil system outside engine hall ➤ LO system pipe insulation outside engine hall 											
<p>A.4. 2</p>	<ul style="list-style-type: none"> ➤ COMPRESSED AIR SYSTEM ➤ Starting air bottle ➤ Starting air compressor unit – double ➤ Starting air compressor unit – single ➤ Instrument air compressor unit 	<p>1 lot</p>										

	<ul style="list-style-type: none">➤ Instrument air bottle➤ Piping and valves compressed air system (set)												
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Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)									
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)
A.4.3	<p>COOLING SYSTEM including</p> <ul style="list-style-type: none"> ➤ Cooling radiator and auxiliaries ➤ Maintenance fresh water tank unit ➤ Piping and valves maintenance water system (set) ➤ Piping and valves cooling system inside engine hall ➤ Piping and valves cooling system outside engine hall 	1 lot										
A.4.4	<p>CHARGE AIR SYSTEM including</p> <ul style="list-style-type: none"> ➤ Charge air filter ➤ Ducting charge air system (set) 	1 lot										

<p>A.4. 5</p>	<p>EXHAUST SYSTEM with stack height $\geq 7\text{m}$ including</p> <ul style="list-style-type: none"> ➤ Exhaust gas silencer ➤ Bellows for exhaust gas silencer ➤ Ducting exhaust gas system (set) ➤ Bellows for exhaust gas ducting ➤ Insulation exhaust gas ducting (set) ➤ Exhaust gas stack pipe 	<p>1 lot</p>											
<p>A.4. 6</p>	<p>OILY WATER SYSTEM including</p> <ul style="list-style-type: none"> ➤ Oily water transfer pump units ➤ Oily water buffer tank ➤ Oily water feed pump unit ➤ Oily water treatment unit ➤ Sludge tank ➤ Sludge loading pump unit ➤ Piping and valves oily water treatment system (set) ➤ Sludge disposal 	<p>1 lot</p>											

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)									
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)
A.4.7	WATER TREATMENT SYSTEM including ➤ Water treatment unit ➤ Treated water storage tank ➤ Water booster unit ➤ Piping and valves oily water treatment system (set)	1 lot										
A.4.8	ENGINE FIRE FIGHTING SYSTEM	1 lot										
17.4.5 A.5 - HEATING SYSTEM												
	Electrical trace heating											

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)										
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)	
17.4.6 A.6 - MISCELLANEOUS													
	Other miscellaneous System / equipment / materials for mechanical auxiliaries and ancillary system	1 lot											
17.4.7 A.7 - BLACK START UNIT													
	Emergency diesel generating set complete in all respect including all auxiliaries and ancillary systems).	1 lot											
17.4.8													

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)										
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)	
17.4.9 A.8 - ELECTRICAL SYSTEMS													
A.8.1a	MAIN SWITCHGEAR including auxiliaries <ul style="list-style-type: none"> ➤ Generator cubicles ➤ Grounding transformer system 3 No. ➤ Outgoing Feeder cubicles 7 No. ➤ Incoming Feeder cubicles 2 No. ➤ Station auxiliary transformer and cubicle 2 No. ➤ Measuring cubicle 3 No. ➤ Bus riser cubicle with measurement 2 No. ➤ Spare cubicles 2 No. 	1 lot											

A.8. 1b	<p>Substation transformer</p> <p>One (1) 60 MVA 69kV/13.8kV 60Hz ONAN substation transformer</p>	1 lot											
A.8. 1c	<p>Cables and conductors</p> <p>All necessary cables and conductors in appropriate size and quantity conforming to the relevant NEC/IEC standards for electrical installation and National Grid Code for thermal loading</p>	1 lot											
A.8. 2	<p>STATION SERVICE SYSTEM</p>	1 lot											
A.8. 3	<p>DC SYSTEM</p>	1 lot											
A.8. 4	<p>PLANT ELECTRIFICATION AND EARTHING including</p> <ul style="list-style-type: none"> ➤ Safety earthing system (above ground) ➤ Electrification of all buildings ➤ Emergency lighting for all buildings ➤ Lighting protection system ➤ CCTV system 	1 lot											

A8.5	GROUNDING	1 lot											
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Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)										
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)	
17.4.10	A.9 - CONTROL & PROTECTION SYSTEM												
A15.1	Control and Protection System including <ul style="list-style-type: none"> ➤ Automation System ➤ Operator's Station ➤ Control panels & Desks, ➤ Protection panels, ➤ Switchgear control desk, ➤ Synchronizing panel, ➤ Auxiliary power supply panel, ➤ Control and protection panel ➤ Any other required control & protection panel and desk etc. 	1 lot											

17.4.11 A.10 - MISCELLANEOUS MECHANICAL												
	Other Mechanical System (if not mentioned above)	1 lot										
17.4.12 A.11 - CONSUMABLES (initial filling)												
	First fillings of lubricating oil of engines	1 lot										
	First fillings of chemicals for water treatment	1 lot										
	Other consumables (filters, grease etc.)	1 lot										

Sl. No	Item Name	Qty	U.S. DOLLAR (U.S. \$)										
			FOB Price		Freight		Insurance		Insurance for Transportation up to Site		Custom Clearance and Inland Transportation	TOTAL COST (CIF)	
			Rate	Total (a)	Rate	Total (b)	Rate	Total (c)	Rate	Total (d)	Total (e)	(a+b+c+d+e)	
17.4.13	B.2 - FIRE PROTECTION SYSTEM												
B2.1	FIRE DETECTION SYSTEM <ul style="list-style-type: none"> ➤ Fire Alarm Center ➤ Fire Detectors ➤ Fire Alarm Devices ➤ System Auxiliaries 	1 lot											
B2.2	FIRE FIGHTING SYSTEM <ul style="list-style-type: none"> ➤ Fire water pumps ➤ Fire water reservoir tank ➤ Hydrant system including water main, hydrant stands, hoses etc. ➤ Outdoor and indoor hose cabinets ➤ Portable firefighting equipment, (CO2, foam & dry powder) 	1 lot											

	<ul style="list-style-type: none"> ➤ Auxiliaries (pipes, valves etc.) ➤ Other firefighting equipment 											
17.4.14	B.3 - INCINERATOR SYSTEM	1 lot										
MAINTENANCE FACILITY SUB-TOTAL												
17.5 C - SPARE PARTS AND CONSUMABLES FOR 2 YEARS WARRANTEE PERIOD												
17.5.1 C.1 - CONSUMABLES												
	Consumables for warranty period operation (including all chemicals, filters, gaskets etc.)	1 lot										
17.5.2 C.2 - SPARES												
C.2.1	<p>SPECIAL MAINTENANCE TOOLS</p> <p>Special maintenance tools including</p> <ul style="list-style-type: none"> ➤ Engine maintenance tools (set) ➤ Tools for turbocharger (set) ➤ HFO separator tools (set) ➤ Lubricating oil separator tools (set) ➤ Other tools 	1 lot										

C.2. 2	OFFICE EQUIPMENT											
C.2. 3	ELECTRICAL WORKSHOP TOOLS (Current injection test set, Megger, Multimeter, Welding set etc.)	1 lot										
C.2. 4	MACHINE SHOP EQUIPMENT & TOOLS including Pillar drill, Universal miller, Grinding machine, Small universal machine tools, Machine hacksaw, Welding sets, etc.	1 lot										
C.2. 5	Others, if necessary (Bidder shall specify those items)	1 lot										
SPARES & CONSUMABLES SUB-TOTAL												

17.6 SCHEDULE -3 INSTALLATION & COMMISSIONING

Sl. No	Description	Qty	Erection & Commissioning		Insurance for Erection & Commissioning	
			U.S. Dollars (U.S. \$)			
			Rate	Total	Rate	Total

3A	Engine Generating sets complete with auxiliary equipment	1 (one) lot.				
3B	Control equipment and other electrical equipment and materials.	1 (one) lot.				
3C	Maintenance facilities, fuel unloading and handling facilities, firefighting facilities and other mechanical facilities	1 (one) lot.				
3D	Others, if necessary (Bidder shall specify those items)	1 (one) lot.				
INSTALLATION & COMMISSIONING SUB-TOTAL						

17.7 SCHEDULE -4 CIVIL & Facility WORKS:

Sl. No	Description	Qty	Civil & Building Works		Insurance for Civil & Building Works		TOTAL COST
			(U.S. \$)				
			Rate	Total	Rate	Total	Total Cost
17.8 4 - CIVIL WORKS AND STRUCTURES							
17.8.1 4.A - POWER PLANT							
4.A.1	SITE DEVELOPMENT WORK						

	<p>Foundations Drains, Ducts, Cable trenches Sewage systems, Internal roads, Area and boundary lighting, Guard huts, and boundary fence.</p>	<p>1 lot.</p>					
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4.A.2	ELECTRICAL EQUIPMENT Facility / CONTROL ROOM/PLANT ADMINISTRATION						
	Electrical Equipment including: Earthworks and substructures, Superstructures, Ventilation, Air-Conditioning Plumbing and sanitary installations Electrification Fire detection Firefighting,	1 lot					
Sl. No	Description	Qty	Civil & Building Works		Insurance for Civil & Building Works		TOTAL COST
			(U.S. \$)				
			Rate	Total	Rate	Rate	Total
4.A.3	FUEL TREATMENT Facility						
	Fuel treatment facility including Earthworks and substructures,	1 lot.					

	Superstructures, Ventilation Plumbing and sanitary installations, Electrification, Fire detection, Portable fire extinguisher (dry powder type) Overhead Crane, Fuel treatment building pipe support						
4.A.4	FIRE FIGHTING STRUCTURES						
	Firefighting structures Earthworks and substructures	1lot.					
POWER PLANT Facility SUB-TOTAL							
17.8.2							

Sl. No	Description	Qty	Civil & Building Works		Insurance for Civil & Building Works		TOTAL COST
			(U.S. \$)				
			Rate	Total	Rate	Rate	Total
4.B - OIL STORAGE AND CONTAINMENT AREAS							
4.B.1	DAY TANK CONTAINMENT AREA						
	Day tank containment area including: <ul style="list-style-type: none"> ➤ Earthworks, substructures, R.C slab and R.C retaining wall and R.C ring wall for: <ul style="list-style-type: none"> ▪ Heavy fuel oil buffer tank ▪ Oily water buffer tank ▪ Sludge tank ▪ Lubricating oil storage tank: fresh oil ▪ Lubricating oil storage tank : used oil ▪ Lubricating oil service tank 	1 lot					
OIL STORAGE & CONTAINMENT AREAS SUB-TOTAL							

Sl. No	Description	Qty	Civil & Building Works		Insurance for Civil & Building Works		TOTAL COST
			(U.S. \$)				
			Rate	Total	Rate	Rate	Total
4.C - AUXILIARY STRUCTURES							
4C.1	COOLING SYSTEM STRUCTURES						
	Cooling System Structures including <ul style="list-style-type: none"> ➤ Earthworks and substructures ➤ Cooling radiator/tower ➤ Pipe support 	1 lot					
4C.2	CHARGE AIR/EXHAUST GAS DUCTING AND BOILER SUPPORT STRUCTURES						
	Charge Air/Exhaust Gas Ducting, Stack and Boiler Support Structures including <ul style="list-style-type: none"> ➤ Steel structures for charge air duct support (set) ➤ Steel structures for auxiliary equipment support (set) ➤ Steel structures outside the building (set) ➤ Superstructures, exhaust gas tank ➤ Earthworks and substructures,, exhaust gas tank ➤ Earthworks and substructures, heat recovery container ➤ Superstructures, boiler support ➤ Earthworks and substructures, boiler support 	1 lot					

4C.3	OIL/WATER COLLECTING AND SEPARATION STRUCTURES						
	Oil/Water Collecting and Separation Structures including <ul style="list-style-type: none"> ➤ Oily water collecting pit ➤ Superstructures, oily water transfer pump shelter ➤ Superstructures, oily water treatment unit ➤ Earthworks and substructures, oily water treatment unit ➤ Plumbing & sanitary installations, oily water treatment unit 	1 lot					
4C.4	WATER TREATMENT STRUCTURES						
	Water Treatment Structures including <ul style="list-style-type: none"> ➤ Earthworks and substructures, treated water storage tank 	1 lot					
4C.5	OTHER AUXILIARY STRUCTURES						
	Earthworks, substructures and superstructures for: <ul style="list-style-type: none"> ➤ Transformer ➤ Black Start Unit ➤ Sign and other structures 	1 lot					
AUXILIARY STRUCTURES SUB-TOTAL							
Sl. No	Description	Qty	Civil & Building Works (U.S. \$)	Insurance for Civil & Building Works	TOTAL COST		

			Rate	Total	Rate	Rate	Total
4D	SITE WORKS						
	Earthworks, substructures, superstructures, equipment and materials for: <ul style="list-style-type: none"> ➤ Earth excavation on plot ➤ Filling on plot ➤ Underground and surface drains ➤ Pipelines on plot, cable trench to feeders ➤ Sidewalks ➤ Pavements, roads and parking ➤ Power plant surface covering (gravel) ➤ Lawns ➤ Pavements, kerbs and rainwater drainage ➤ Internal and access roads ➤ Water system ➤ Sewage system including septic tanks ➤ Area and perimeter lighting 	1 lot					
4G	OTHERS, if necessary (Bidder shall specify those items)						
SITE WORKS SUB-TOTAL							

17.9 SCHEDULE -5 SERVICES

Sl. No.	Description	Qty	U.S. \$	
			Rate	Total
5A	Design and Engineering	1 lot		
5B	Workshop Tests including Test Witnessing	1 lot		

5C	Training – Six months after plant acceptance	1 lot		
5D	Documents (drawings, operation manuals etc.)	1 lot		
5E	Service for Execution of maintenance works (inspection, repair, overhauling etc.) during 2 years warranty period	1 lot		
SERVICES SUB-TOTAL				

18 STANDARD FORMS

Standard Forms include the following:

- Form of Bid Security (Bank Guarantee)
- Form of Contract Agreement
- Form of Performance Security (Bank Guarantee/ Insurance Bond)
- Form of Bank Guarantee for Advance Payment
- Indemnity Bond For Secured Advance
- Registration Form

18.1 Form of Bid Security (Bank Guarantee)

.....Bank’s Name and Address of issuing Branch or Office.....

Beneficiary: Name and Address of Public Body.....

Date:

BID GUARANTEE No.:

We have been informed that*name of the Bidder*..... (hereinafter called "the Bidder") has submitted to you its bid dated..... (hereinafter called "the Bid") for the execution of*name of contract*..... under Invitation for Bids No.....*IFB number* (“the IFB”).

Furthermore, we understand that, according to your conditions, bids must be supported by a bid security.

At the request of the Bidder, we*name of Bank* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of*amount in figures*..... (*amount in words*.....) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder:

- (a) has modified or withdrawn its Bid after the deadline for submission of its bid during the period of bid validity specified by the Bidder in the Form of Bid; or
- (b) has refused to accept a correction of an error appearing on the face of the Bid; or
- (c) having been notified of the acceptance of its Bid by the Public Body during the period of bid validity, (i) has failed or refused to sign the contract Form, if required, or (ii) has failed or refused to furnish the performance security, in accordance with the Instructions to Bidders

This guarantee shall expire: (a) if the Bidder is the successful bidder, upon our receipt of copies of the contract signed by the Bidder and the performance security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful bidder; or (ii) thirty days after the expiration of the Bidder’s Bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before

.....Bank's seal and authorized
signature(s).....

18.2 FORM OF CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT (hereinafter called the “Agreement”) made on the _____ day of _____ (month) 20____ between _____ (hereafter called the “Employer”) of the one part and _____ (hereafter called the “Contractor”) of the other part.

WHEREAS the Employer is desirous that certain Works, viz _____ should be executed by the Contractor and has accepted a Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein.

NOW this Agreement witnesseth as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents after incorporating addenda, if any except those parts relating to Instructions to Bidders shall be deemed to form and be read and construed as part of this Agreement, viz:
 - 1 (a) The Contract Agreement
 - 1 (b) The Letter of Acceptance
 - 1 (c) The Letter of Tender
 - 1 (d) The Preamble to Conditions of Contract
 - 1 (e) The Particular Conditions of Contract
 - 1 (f) The General Conditions of Contract
 - 1 (g) The Employer’s Requirements
 - 1 (h) The Schedules
 - 1 (i) The Contractor’s proposal
 - 1 (j)
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy defects therein in conformity and in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor, in consideration of the execution and completion of the Works as per provisions of the Contract, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused this Agreement to be executed on the day, month and year first before written in accordance with their respective laws.

Signature of the Contactor

Signature of Employer

(Seal)

(Seal)

Signed, Sealed and Delivered in the presence of:

Witness:

Witness:

(Name, Title and Address)

(Name, title and Address)

18.3 FORM OF PERFORMANCE SECURITY
(Bank Guarantee/ Insurance Bond)

Guarantee No. _____ Executed on _____ Expiry date _____

Name of Guarantor (Bank/Approved Insurance Company) with address: _____

Name of Principal (Contractor) with address: _____

Penal Sum of Security (express in words and figures)

Letter of Acceptance No. _____ Dated _____

KNOW ALL MEN BY THESE PRESENTS, that in pursuance of the terms of the Bidding Documents and above said Letter of Acceptance (hereinafter called the Documents) and at the request of the said Principal we, the Guarantor above named, are held and firmly bound unto the

_____ (hereinafter called the "Employer") in the penal sum of the amount stated above for the payment of which sum well and truly to be made to the said Employer, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has accepted the Employer's above said Letter of Acceptance for

_____ (Name of Contract) for the _____

_____ (Name of Project).

NOW THEREFORE, if the Principal (Contractor) shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said Documents during the original terms of the said Documents and any extensions thereof that may be granted by the Employer, with or without notice to the Guarantor, which notice is, hereby, waived and shall

also well and truly perform and fulfill all the undertakings, covenants terms and conditions of the Contract and of any and all modifications of said Documents that may hereafter be made, notice of which modifications to the Guarantor being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue till all requirements of Clause 11.7, Defects after Taking Over, of Conditions of Contract are fulfilled.

Our total liability under this Guarantee is limited to the sum stated above and it is a condition of any liability attaching to us under this Guarantee that the claim for payment in writing shall be received by us within the validity period of this Guarantee, failing which we shall be discharged of our liability, if any, under this Guarantee.

We,___(the Guarantor), waiving all objections and defences under the Contract, do hereby irrevocably and independently guarantee to pay to the Employer without delay upon the Employer's first written demand without cavil or arguments and without requiring the Employer to prove or to show grounds or reasons for such demand any sum

or sums up to the amount stated above, against the Employer's written declaration that the Principal has refused or failed to perform the obligations under the Contract which payment will be effected by the Guarantor to Employer's designated Bank & Account Number.

PROVIDED ALSO THAT the Employer shall be the sole and final judge for deciding whether the Principal (Contractor) has duly performed his obligations under the Contract or has defaulted in fulfilling said obligations and the Guarantor shall pay without objection any sum or sums up to the amount stated above upon first written demand from the Employer forthwith and without any reference to the Principal or any other person.

IN WITNESS WHEREOF, the above-bounden Guarantor has executed this Instrument under its seal on the date indicated above, the name and corporate seal of the Guarantor being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Guarantor (Bank/Approved Insurance Co.)

Witness:

1. ____

Signature ____

Name _____

Corporate Secretary (Seal)

Title __

2. ____

Name, Title & Address

Corporate Guarantor (Seal)

18.4 FORM OF BANK GUARANTEE FOR ADVANCE PAYMENT

Guarantee No. _____ Executed on _____ Expiry date _

WHEREAS the _____ (hereinafter called the Employer) has entered into a Contract for _____

(Particulars of Contract), with

(hereinafter called the Contractor).

AND WHEREAS the Employer has agreed to advance to the Contractor, at the Contractor's

request, an amount of_(USD_)

which amount shall be advanced to the Contractor as per provisions of the Contract.

AND WHEREAS the Employer has asked the Contractor to furnish Guarantee to secure advance payment for performance of his obligations under the said Contract.

AND WHEREAS _____ (Bank)

(hereinafter called the Guarantor) at the request of the Contractor and in consideration of the Employer agreeing to make the above advance to the Contractor, has agreed to furnish the said Guarantee.

NOW THEREFORE the Guarantor hereby guarantees that the Contractor shall use the advance for the purpose of above mentioned Contract and if he fails, and commits default in fulfillment of any of his obligations for which the advance payment is made, the Guarantor shall be liable to the Employer for payment not exceeding the aforementioned amount.

Notice in writing of any default, of which the Employer shall be the sole and final judge, as aforesaid, on the part of the Contractor, shall be given by the Employer to the Guarantor, and

on such first written demand payment shall be made by the Guarantor of all sums then due under this Guarantee without any reference to the Contractor and without any objection.

This guarantee shall come into force as soon as the advance payment has been credited to the account of the Contractor.

This guarantee shall expire not later than _____

by which date we must have received any claims by registered letter, telegram, telex or telefax.

It is understood that you will return this Guarantee to us on expiry or after settlement of the total amount to be claimed hereunder.

Guarantor (Bank)

Witness:

1. ____

Signature ____

Corporate Secretary (Seal)

Name _____

Title __

2. ____

Name, Title & Address

Corporate Guarantor (Seal)

**18.5 INDEMNITY BOND FOR SECURED ADVANCE
AGAINST MATERIALS BROUGHT AT SITE**

(ON USD40 NONJUDICIAL STAMP PAPER)

This Deed of Indemnity is issued by M/s.

_____ (Name of the Contractor) in favour
of

M/s.__(Name of the Employer).

Whereas__(hereinafter called the Employer) has agreed to pay the Secured Advance against the cost of material through any Bank or like agency by any other method by virtue of the terms of the contract existing between the parties. The details of the material and their price for which secured advance is being sought for the period _____ till consumption of the material is as under :-

- 1. ___ at USD _____ per _____ = USD
- 2. ___ at USD _____ per _____ = USD
- 3. ___ at USD _____ per _____ = USD
- 4. ___ at USD _____ per _____ = USD

THEREFORE, THIS DEED OF INDEMNITY WITNESSETH AS FOLLOWS:

I/We__ of M/s. _____

do hereby indemnify M/s _____ for all losses due to thefts, arson, pilferage, loss due to flood and inundation, shortage, deterioration and depreciation etc. through any act of Man or God or slump in the Market of any or all the materials financed or paid by the Employer on our request for financing payment against material.

I/We__ shall indemnify _____ against any or all

claims, action damages arising out of or resulting to the said material.

I/We__further declare that we will faithfully abide by the above declaration and solemnly affirm that we will not remove, sell, pilferage any of the materials against which M/s _____has_ paid us such a secured advance and will not pledge the same with any Bank, Finance Corporation, Firm, Company, Individual or the like agency or create any change whereon in any from what so ever.

I/We__do hereby also declare that in the event of my/our infringement of the declaration made above_____will be entitled to forfeit all such material and also proceed against me/us according to the relevant clause pertaining to breach of contract and further invoke the power or seek any remedies secured of _____under the contract Agreement signed with us or otherwise available under law.

Place_Dated _____

Contractor __

18.6 REGISTRATION FORM

- The undersigned received (or accessed) the “**PROCUREMENT OF WORKS - CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION PLANT - GPL-PD-063-2022**”
- We have reviewed the package and we do [] do not [] (please check one), intend to submit a Proposal.

Further, we understand that our duly completed Proposal Document will be due on [].

At the present time, we anticipate our Proposal Document will be based upon the following corporate or joint venture arrangements:

Lead Firm :

Address :

Contact Details :

.....

Other Firm/Partner* :

Address :

Contact Details :

Applicant’s Representative :
(Name & Designation)

.....

(Signature)

Date :

* Details should be provided for each Other Firm/Partner.

19 SAFETY, HEALTH & ENVIRONMENTAL GUIDELINES (CONTRACTORS)

Safety Health Environmental Unit – September 2020

CONTENT PAGE

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- OCCUPATIONAL HEALTH
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- EMERGENCY RESPONSE
- HSE AUDITS
- PROCEDURES AND WORK PRACTICES

19.1 INTRODUCTION

19.1.1 Purpose

The Guyana Power and Light Inc. (hereafter refer to as (GPL) Safety Health and Environmental Plan (hereafter refer to as SHE Plan) describes the minimum requirements expected of GPL’s employees, contractors, customers and visitors.

The SHE Plan is part of GPL’s total commitment to provide a safe working environment at all times and the goal of achieving incident free workplaces.

This SHE plan outlines how GPL shall comply with all relevant Acts, Regulations, Codes of Practice, standards and requirements. This will be updated as may be necessary and tailored to suit the requirements and needs of GPL and in keeping with any new legislative requirements.

This plan applies to all activities associated with and carried out on all GPL’s locations.

19.1.2 Abbreviations and Terminologies

	ARAP	-	As Reasonable and Practicable
	OSH Act	-	Occupational Safety and Health Act Cap.
99:06			
	SHE	-	Safety Health and Environment
	SHEO	-	Safety Health and Environmental Officer
	ASHEO	-	Assistant Safety Health and Environmental
Officer			
	PPE	-	Personal Protective Equipment
	MSDS	-	Material Safety Data Sheet
	BPN	-	Best Practicable Means
	ECC	-	Emergency Control Center

19.1.3 References:

Occupational Safety and Health Act Cap. 99:06

Environmental Protection Agency Act Cap 20:05

Fire Prevention Act Cap. 22:01 and Fire Prevention (Amendment) Act No. 34 of

2009

19.2 HEALTH AND SAFETY MANAGEMENT SYSTEM

The SHE management system is made up of the following documents:

Document	Description
Policies	Policies set the overall guidelines and direction of GPL’s approach to SHE.
SHE Procedures	Procedures relevant to the management and administration of jobs relating to all GPL’s activity.
Emergency Response	GPL response plan which includes identified emergency and environmental response.
Environmental Management Plan	Describes the environmental controls to be implemented and measures to be taken for a particular geographic work area, process or discipline.
Safety Health and Environmental Plan (This Plan)	Describe the SHE administration and management framework for GPL. This includes responsibilities, risk assessment, training and inductions, general safety rules and protocols, risk controls, audits and management controls.

19.3 MANAGEMENT LEADERSHIP AND COMMITMENT

19.3.1 Responsibilities

Divisional Director – Quality, Safety, Health and Environment

The Divisional Director has the overall responsibility of ensuring the objectives of the SHE Plan and policies are met and that all jobs within the company is delivered injury and incident free, this will be achieved by:

- Ensuring that all relevant and necessary human and material resources to enable the teams to meet their responsibilities.
- Ensuring that the appropriate SHE systems are developed, approved, implemented and maintained during operations.
- Ensuring that competent personnel are recruited and that adequate training is provided to ensure that all employees have the necessary knowledge and skills to competently perform their jobs.
- Establish a process for review and continual improvement.

Safety Health and Environmental Officer

The SHEO is responsible for the development of the SHE plan, and work with the various levels of Management to implement same. This will be achieved by:

- Develop and provide training on the implementation of the company’s SHE plan.

- Liaison with statutory and local regulatory authorities where required, to ensure that safety and health issues which arise are resolved in a timely manner to the benefit of the company.
- Review workplace health and safety documents, procedures, risk assessment, etc.
- Assist to resolve disputes which may impact personnel, plant or equipment.
- Undertaking regular safety and health inspections to all locations.

Supervisory Personnel (GPL)

The GPL personnel with direct oversight of the project/contract is responsible and accountable for the implementation of the provisions of this SHE plan by Contractors. This will be achieved by:

- Acting in compliance with the provisions and requirements of the SHE plan.
- Ensuring that the Contractor and all employees of GPL follow the requirements of the plan.
- Ensuring that GPL's emergency response plans are followed should any incident or emergency arise.
- Reporting all OHS non-conformances; including, safety and environmental breaches, incidents and dangerous practices and occurrences.
- Ensuring that reasonable care is being taken by the Contractor to maintain a high standard of workmanship so as to protect the health and safety of themselves and other persons.
- Ensuring that all work sites are returned to a safe state by the Contractor at the completion of all tasks.

Contractors

Contractors shall be required to:

- Provide copies of this SHE plan to their supervisory personnel prior to the commencement of any contract for work to be done.
- To comply with all GPL's SHE policies, requirements and practices.
- To provide MSDS for all hazardous materials which they intend to use on any GPL'S site.
- Comply with all reasonable instructions given to them by GPL's representative.
- Attend any safety deliberations that may be convened by GPL's representative.
- Convene tool box discussions with their employees to ensure that all the necessary SHE protocols are followed.
- Conduct and participate in worksite inspections and make observations necessary to mitigate any risk to persons or property.

- Observe all statutory requirements relating to health, safety, quality and the environment.
- Cooperate fully with procedures and consultative arrangements.

Employees

Employees of Contractors shall be required to:

- Report to work fit for duty.
- Have the appropriate skill, qualifications and training to undertake the task they are performing.
- Follow all reasonable health and safety instructions given.
- Wear all approved company issue PPE during the execution of their duties.
- Rectify and report all hazards.
- Follow work procedures, and to stop and reassess if the work methodology or risk changes.

19.3.2 SHE Policy

GPL is committed to ensuring a safe and healthy working environment for all personnel associated with their operations as well as caring for the environment.

This SHE plan shall support the SHE policies which provide a framework for management's commitment through visible leadership and a vigilant culture which rigorously supports the implementation and continuous improvement in the SHE program.

The GPL's policies shall be widely circulated and prominently displayed in all areas.

19.3.3 Goals and Objectives

The goal of this SHE plan is to ensure that all the GPL's operations are conducted in accordance with the minimum requirements of all legislation pertaining to Occupational Safety and Health and the Environment. For this to be achieved management, employees and Contractors are required to demonstrate a personal commitment to achieving excellence in all tasks being undertaken.

This will aid in achieving our goals:

- To operate incident and injury free.
- To have available and post copies of the relevant legislation pertaining to OH&S and the Environment in work places for access by employees.
- To take all reasonable steps for the protection of Health and Safety of employees.
- To ensure that the environment is not adversely affected by any operations carried out by and on behalf of the GPL.
- Foster a quality culture "Do it once and do it well"
- To respect the community
- To provide our customers with a great experience.

19.4 CONTRACTORS MANAGEMENT

All contractors and contractor employees have an obligation to adhere to and comply with all relevant legislation, policies, procedures and instructions in striving for an injury and incident free operations whilst being engaged by the GPL.

19.4.1 Contractor SHE Systems and Procedures

The contractor shall at a minimum comply with:

- The Occupational Safety and Health Act Cap. 99:06;
- The Environmental Protection Agency Act Cap. 20:05;
- This SHE Plan;
- Applicable GPL rules and regulations;
- Any other requirement specified by the GPL.

19.4.2 Assessment of Contractors

Prior to engagement, all contractors shall provide copies of the relevant licenses, insurance, and any other relevant documentation for review by GPL.

Only after a successful review and approval, shall the contractor be permitted to commence operations.

At times, GPL may request that a contractor submit additional records, procedures, training records or other information for assessment and/or validation. Upon any reasonable request, the contractor will submit such documentation.

19.5 COMMUNICATION AND CONSULTATION

An integral part of the SHE management system is the open communication of information between all levels of management, employees and contractors. In achieving this goal, GPL and their Contractors, as well as the Contractor and their employees, shall conduct SHE meetings, inclusive of tool box talks and other safety discussion prior to commencement of all tasks. It is the expectation that the Managers/Supervisors of the various work groups shall take the lead in ensuring that these discussions are held and documentation are made.

19.5.1 SHE Meetings

The standard SHE meetings that maybe carried out may include at a minimum:

- Tool Box Talks prior to commencement of a task.
- Management/Contractor's coordination meetings.
- Safety Committee Meetings (by law or request by GPL).

Formal records of such meetings should be maintained for review.

19.5.2 Tool Box Talks

Tool Box Talks should be convened prior to commencement of a task or as otherwise determined and agreed. These meetings should involve Contractor's supervisors and employees and should be documented for review by GPL, if required.

The topics covered by tool box meetings shall include:

- Discussion of incidents and occurrences at the work sites.
- Presentation of SHE topics which in the view of the supervisor that would assist the employees to perform their jobs safely and competently.

19.5.3 Contractor's Coordinating Meeting

Contractors' Coordinating Meetings will be scheduled by GPL's personnel.

These meetings may include:

- Projection of works.
- Integration of activities
- Review of hazards identified during inspections and risk assessments.
- Health, Safety and Environmental issues.

19.5.4 Safety Committee Meetings

The formulation of Health and Safety Committees and the appointment of Health and Safety Representatives shall be done in accordance with the OSH Act.

19.5.5 SHE Issue Resolution

The Contractor will endeavour to resolve SHE issues whilst, wherever possible, maintain productive work. It is emphasized that at all times employees must accept responsibility for their own safety. In general, the process shall follow the procedures outlined in the OSH Act:


- A. Where the health and safety problem exist which can be rectified by the individual, it shall be rectified; otherwise
- B. Report the problem to the supervisor for rectification, allowing sufficient time; otherwise
- C. Report the problem to an elected safety representative (where elected) for rectification, allowing sufficient time; otherwise.
- D. Report the issue to the GPL personnel with oversight of the project/contract who shall consult with the Contractor to have issue rectified as soon as practicable.

Where Contractor fail and/or refuses to rectify SHE issue reported to them, GPL may take whatever steps it deems necessary, in accordance with the contract.

19.6 RISK MANAGEMENT

Risk Management is the systematic process of identifying hazards, evaluating risk, implementing controls and monitoring effectiveness. Throughout the duration of the operation, hazard identification tools and techniques shall be used and documented evidence kept for review.

Controls of risk identified shall be determined using the Hierarchy of Controls process.

Most Effective	Elimination	Remove hazards completely
	Substitution	Replace/reduce the hazard with a lower risk alternative
	Isolation	Isolate the worker from the hazard
	Engineering Controls	Involves some changes to the work environment or work process to place a barrier to, or interrupt the transmission path between the worker and the hazard
	Administrative Controls	The use of procedures, hazard control plans, signs, training, etc
Less Effective	PPE	The use of Personal Protective Equipment/Clothing.

Note: Where the risk cannot be eliminated, a combination of controls can be utilized to control the risk.

19.6.1 Risk Assessment

All hazards or risk should be evaluated using the following risk matrix. Attached appendix I.

19.6.2 Hazard Register

All hazards identified during an inspection or when a risk assessment is done must be documented. These records will be progressively reviewed to track progress of rectification.

19.6.3 Hazard Observation and Reporting

The reporting of all hazards shall be encouraged so that they are investigated and assessed to ensure timely, remedial and preventative action(s) are taken.

All persons especially supervisory staff should be trained in this procedure. They are encouraged to use this SHE tool to record any observed risk hazards or unsafe conditions that presents immediate threat to health, safety and environment.

19.6.4 Work Place Inspections

- Informal Inspections
- Formal Inspections
- Impromptu Inspections
- Follow up inspections
- Plant and Equipment Inspections
- Inspections and Audits as required by contract.

An inspection report shall be compiled and retained for records and follow up.

19.7 TRAINING AND COMPETENCY

19.7.1 Personnel Selection

All personnel employed or engaged by GPL shall have adequate knowledge and experiences for the task for which they are being engaged and shall be the holder of the appropriate qualification / licenses for the position.

19.7.2 Licenses and Certificates of Competency

All persons being engaged shall satisfy at minimum the GPL job requirements regarding qualifications and work experiences for the job function for which they are being engaged.

All persons performing activities or task that required licenses or certificates of competency shall submit a current copy of all such licenses or certificates of competency prior to engagement as outline in 4.2. Copies shall be retained for records.

Other training certificates, such as First Aid, held by employees are to be copied and attached.

19.7.3 First Aid Training

All GPL's worksites including construction sites where work is being undertaken by a contractor shall be equipped with a First Aid kit to assist in dealing with any accident or emergencies. There should also be in those workplaces person(s) trained to administer emergency first aid. It shall be the responsibility of all contractors to make these provisions for their employees for the duration of any work being undertaken on behalf of GPL.

19.7.4 Emergency Response

Emergency response requirement shall be considered in all operations.

Personnel shall be required to participate in regular emergency drills based on likely incident scenarios.

19.7.5 Training Assessment

In an effort to ensure that all employees remain competent in the performance of their duties and function, continuous training shall be provided to equip them with the knowledge and skills required to perform their jobs in a safe and competent manner. Training needs will be determined using:

- Information provided in employee's performance appraisals.

- Training needs assessment.
- Job and task assessments.

19.7.6 Training Records

Records shall be maintained of all SHE training undertaken and provided to employees. The records kept shall include:

- The type of training convened.
- The date, time and place the training was conducted.
- The names and signatures of the trainees.
- The content covered during the training.

19.8 OCCUPATIONAL HEALTH

19.8.1 Fitness at Work

No person shall be allowed on the worksite while being fatigued or under the influence of alcohol or illicit drugs, or otherwise deemed to be a RISK.

GPL through the respective supervisor shall reserve the right to request that an employee or contractor who is suspected to be under influence whilst being on official company business or on any company premises to subject themselves to such tests to determine their fitness to be work. Such test shall be conducted in accordance with the standard procedures to be done by agencies to be determined by GPL.

19.8.2 Hazardous Substances and Dangerous Materials

GPL shall comply with all State Guidelines, Legislations and relevant Codes of Practices as it relates to Hazardous Substances and Dangerous Materials. All Hazardous Substances and Dangerous Materials shall be handled, transported, stored, used and disposed of using the prescribed methods.

19.8.3 Material Safety Data Sheet (MSDS)

MSDS for all Hazardous Substances and Dangerous Materials approved for use by GPL must be available on site for inspection and reference in the event of an emergency.

Provisions including PPE and first aid as recommended by the MSDS shall be made available to all employees required to handle such materials. Personnel using Hazardous Substances and Dangerous Materials shall be appropriately trained in the correct use of such substances or materials.

19.8.4 Working in Heat

Heat exhaustion is common among persons who work in construction and in environment which requires that certain PPE be worn whilst carrying out certain tasks e.g. power generation. This is also true for persons who engage in manual labour and those who work in areas where ventilation is poor. In an effort to protect employees, the following practices shall be adopted:

- Provide suitable and sufficient PPE/C.
- Provide adequate supervision.

- Provide adequate training, inclusive of tool box discussion prior to commencement.
- Ensure that emergency systems are in place in the event of an incident and that all persons are adequately trained in such.

19.8.5 Noise and Hearing

The effects of sound above 85 dB over an 8 hours period can result in permanent hearing loss.

As such, it is the responsibility of the Contractor to provide hearing protection and to take such measures as may be appropriate for the protection of persons that may be exposed to such by:

- a) Installation of signs mandating that hearing protection be worn in certain places.
- b) Train employees as to the dangers of working in an excessively noisy environment for prolonged periods.
- c) Incorporate engineering controls in the construction of buildings and offices in an effort to reduce sounds at its source.

It is the responsibility of the supervisory staff to ensure that all employees adhere to all PPE/C usage compliance.

19.8.6 Hygiene

Occupational Hygiene is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objective of protecting worker health and well-being and safeguarding all persons.

It is therefore recommended that good hygienic practices should be maintained at all times to ensure personal and environmental cleanliness and preventing the spread of diseases.

19.9 ENVIRONMENT

19.9.1 Surrounding Land Uses, Hazards, Interfaces and Related Restrictions

Contractor must allow for and carry out a survey, to detect and verify the location and status of all known overhead and underground services, prior to commencing any demolition, site clearance or earthworks where required.

Where there is an imminent risk from GPL's overhead or underground conductors, Contractor must make a formal request to GPL for disconnection, diversion or protection of such overhead or underground conductors as necessary, prior to commencing work. The purging of existing pipe work, tanks or plant containing hazardous substances must be carried out prior to stripping out, removal, dismantling, alteration or extension. Control measures must be established for

safe systems of work and the safe disposal of purge effluent. An appropriate Risk Assessment will be required for all work, and performed under a permit to work as / where necessary.

19.9.2 Interfaces with the General Public

Contractor shall take all measures necessary to protect the general public from any risks arising from works being undertaken. Wherever possible, Contractors shall programme the works and sequences of operations to allow for the complete segregation of all construction activities from the general public. Where this is not possible the Contractor shall identify all known hazards and risks and take appropriate measures to control the risks e.g. provision of hoardings/ barriers, protection from falling materials, avoidance of uneven surfaces, adequate illumination.

19.9.3 Contractor Obligations

All aspects of environmental management associated with the proposed works shall be the responsibility of such company. This encompasses all stages of work from commencement to final hand-over to the GPL. This includes ensuring that all necessary licences and/or consents are obtained for the construction works from the relevant authorities, including those for temporary activities and discharges. Work shall be conducted in such a way as to minimise any adverse environmental impacts of those works throughout their duration.

19.9.4 Environmental Control and Monitoring

There are a number of specific environmental issues to be considered during the Project: -

- Noise and Vibrations
- Pollution
- Emissions and Discharges
- Fuel and Chemical Management
- Energy Management
- Waste Management
- Control of potential spills

19.9.4.1 Noise and Vibrations

The general objective for the management of potential impacts in respect of noise and vibration shall be to control and limit noise and vibration levels from activities at source, by the use of Best Practicable Means (BPM) (e.g. by careful selection of plant, maintenance and location of plant, operation methods and programming, use of noise barriers/screening), ensuring compliance with relevant legislation.

19.9.4.2 Atmospheric Pollution

During operation the principal considerations in respect of atmospheric pollution involve potential dust nuisance and the release of other air pollutants associated with aerial emissions. The general objective for the management of potential impacts in respect of atmospheric pollution shall be to carry out the works, so far as is reasonably practicable, to minimize emissions to air of dust and other pollutants, including odour, in accordance with appropriate legislation and GPL guidelines. Employees shall take all reasonable steps to avoid the creation of dust nuisance by making provision for; The screening, enclosure and spraying of stockpiles

of soil, rubble and construction materials, especially in dry, windy conditions Damping down soil/other materials before depositing. Ensure that adequate covering is provided on each storage load of material to prevent/reduce aerial propellants

19.9.4.3 Fuel and Chemical Management

It is the contractor's responsibility to ensure that all hazardous chemical substances on site are controlled in accordance with local regulations.

19.9.4.4 Control of Potential Spills

Systems for dispensing fuel and other contaminants to mobile and other equipment, should be done in a manner to prevent the possibility of spillage. Spillage catchment kits, designated area with impervious surface, correct type of fuel containers, etc. should be used to reduce the possibility of environmental contamination.

19.9.4.5 Waste Management

All waste on site shall be managed and disposed of in the appropriate and approved manner.

19.10 INCIDENT / INJURY REPORTING AND INVESTIGATION

In order for GPL to meet its SHE objectives, the effective reporting and investigation of incidents/injuries is crucial for:

- Preventing recurrence of similar incidents
- Identifying and rectifying system inadequacies
- Involving and educating personnel
- Informing regulatory and other bodies

19.10.1 Incident and Injury Reporting

All Accident/Incidents and dangerous practices must be verbally reported immediately by the Contractor or their representative on the site to the GPL personnel with oversight of the project/contract who shall conduct an investigation as soon as practicable and prepare and submit the required reports i.e. in the case of an accident, within 24 hours. The Manager responsible for the section, the SHEO and ASHEO as well and the Industrial Nurse shall be informed as soon as practicable after the Accident.

19.10.2 Guidelines for Incident Response and Investigation

All incidents shall be investigated to determine its root cause with the ultimate aim being to eliminate all risk and to implement preventative measures. The responsible GPL personnel shall ensure that the scene of any incident is secured and made safe to prevent any continuation and or escalation of the situation. The GPL personnel shall also ensure that details of the incident are gathered as soon as possible so that no evidence is lost, contaminated, tampered with or forgotten. At a minimum, the following information shall be obtained to assist the investigation:

- Photographs of incident site/injuries
- Statements from the victim (where practicable), witnesses and the immediate supervisor.

- Any other important information including but not limited to work instructions, work procedure, inspection and maintenance reports etc.

19.10.3 Incident Notification

All incidents must be verbally reported immediately and followed by written confirmation and reports as soon as reasonably practicable after the event. Notifications will be in accordance with legislative and GPL requirements.

19.10.4 Statutory Notification

Under the Occupational Safety and Health Act, all occupational accidents that resulted in lost time are notifiable to the authority i.e. Ministry of Labour within 3 days of occurrence.

However, if such accident resulted in death, serious injury or serious illness of a person(s), such is notifiable immediately to the authority.

19.10.5 Injury Management

Injury management is a coordinated and managed process consisting of activities and procedures to facilitate a timely and safe return to work for injured workers. The success of an injury management programme will depend on:

- Actively managing incidents
- Managing open communication between all stakeholders
- Providing temporary alternative duties (modified and /or alternate) as necessary, which are within the injured worker's restriction, physical limitation and abilities.

Early intervention is essential to both the worker's recovery, and the cost effective management of the claim. An immediate planned response can be initiated to determine if the worker is capable of staying at work performing their regular pre-injury duties, modified duties, or alternate duties whilst the injury heals.

If the worker does require time away from the workplace, an effective programme will help the worker return to meaningful, productive and safe work as early and safe as possible.

19.11 EMERGENCY RESPONSE

19.11.1 Emergency Procedure

A major incident is one that may affect several departments within premises; endanger the surrounding community; involve major injuries or fatalities or dangerous occurrences; result in adverse publicity for an organization with ensuing loss of confidence.

Such incidents may be brought about by a malfunction of the normal operating procedures, by the intervention of some outside agency, such as a severe electrical storm, flooding, an act of arson or sabotage, or as a result of terrorist activities, by bomb

threats, by riot or fighting, or contamination threats. Other examples are a pressure vessel explosion, pollution, gas leakage, collapse of a crane, and so on.

All of these events have one thing in common - they are not planned. They will therefore throw the whole workforce/community into panic unless sound Emergency Procedures have been thought through and written down in simple understandable terms and then tested in training sessions for appropriate numbers of people. People must know what to do in emergency situations. This is particularly true of Managers and Supervisors on whose actions under stress their subordinates depend and in whose hands their lives may be placed.

The Company must develop its own strategy aimed at reducing the potential for such major incidents. The design of plant and buildings; the proximity of processes; the integrity of planned maintenance procedures; the use of condition monitoring of key plant items; planned cleaning schedules; frequent inspections of hazardous areas; sound security procedures; well-positioned, well-maintained fire-fighting equipment; well-rehearsed fire drills and procedures; good job training; sound 'No Smoking', alcohol and drug policies; all these things are part and parcel of a well-run business which seeks to minimize the risk to its ongoing welfare from unexpected events.

In considering the types of emergency that might occur, account must be taken of the areas likely to be affected. The interdependence and proximity of plant, buildings, storage areas, conveyor systems and exit points from the site should be considered, as should such factors as the general effect of the direction and strength of prevailing winds on the spread of fire and toxic materials, the site defences against severe flooding in the area, etc.

19.11.2 Preparation

1. A copy of this procedure/plan should be lodged with all key Managers. Its contents may or may not be considered confidential, depending on circumstances.
2. List all key telephone numbers of both internal and external personnel and organizations
3. Ensure that there is an up-to-date Site Plan available at the Main Gate/Security Office and in the key Control Rooms and in the Senior Manager's office. This should show and have labelled all the main buildings, identify fire hydrant points and the location of shut-off valves for supplies of energy and dangerous process materials, show storage areas for oils, gases and other flammable, dangerous or toxic materials.
4. Ensure that outline drawings are available for each floor in each building, showing key plant items, fire escape routes and the position of fire-fighting equipment.
5. Ensure that notes and Data Sheets are also available concerning any specific site hazards such as dangerous chemicals, underground supplies or drains, overhead power lines.
6. Define all emergency exit routes from buildings and from the site.

7. Ensure that back-up lighting systems, such as battery operated lighting, torches and hand lamps, are available and in good working order at all times.
8. In the event of an emergency, define, in advance, who will be in charge of proceedings. This might be a Shift Supervisor or the Senior Manager on site (if quickly available). There must not be a situation where more than one person thinks he is in overall charge. This person must have access to the Emergency Procedures Manual and be able to refer to it quickly and authoritatively.
9. An Emergency Control Centre (ECC) should be nominated, or created if none exist, from where the emergency operations can be controlled. Good communications are the key to this facility. It is often based on the telephone exchange area where there are internal and external telephones and the control console for mobile radios/telephones. A back-up should be considered for the case where the prime choice is out of action, e.g. fire, bomb, etc. An alternative means of communication may be necessary if the telephone lines are down or the power supplies are lost or the back-up batteries are out of action, e.g. cell phones or hand held radios. Clearly, the relative probabilities of each of these possible events need to be carefully considered so that money is not wasted on unnecessary hardware.
10. Ensure that Medical facilities are available to cope with a situation involving several casualties and that an emergency procedure is available for transporting several casualties to the nearest hospital, if required.
11. Have in place agreed procedures with the local authorities such as Fire, Hospital and Police force.
12. Familiarize every employee with the procedures to be carried out in the event of an emergency arising, including making them aware of the positioning of essential equipment and, if appropriate, its use, e.g. alarms, fire-fighting, escape routes, assembly points, etc.
13. Train key personnel in all the appropriate procedures, e.g. use of breathing apparatus, fire-fighting, first aid, fire warden duties, etc.
14. Test warning systems and evacuation procedures at appropriate intervals.
15. Ensure that a complete list of names and addresses of all employees is kept accessible in the event of emergency. This will assist in the calling in of key, competent personnel or in the contacting of relatives in the event of injuries or fatalities.
16. As a major incident will attract the attention of the media, it is essential to make arrangements for official releases of information to the press and other news services. This is best achieved by nominating one Company Spokesperson who may be the Company Public Relations Manager (PRM). All other employees must be instructed not to release information but to refer any enquiries to the PRM who should keep a record of any media enquiries dealt with during the emergency.
17. Review the Emergency Plan at specified intervals, e.g. every two years.

19.12 HSE AUDITS

Regular Safety, Health and Environmental audits are essential to ensuring that the safety management system performs at an optimal level. The schedule of such audits shall be in keeping with the Safety, Health and Environmental Unit schedule for each work location, including sites where construction activities are being carried out on behalf of GPL. Audits will generally be done once per year and a report generated and circulated to all the relevant stake holders within seven days of the exercise. Follow up on progress made with the issues which were identified during the exercise will be done periodically throughout the year.

19.13 PROCEDURES AND WORK PRACTICES

19.13.1 Portable Hand Tools

The following guidelines should be followed when using portable hand tools in the execution of a task:

- Hand tools should be inspected regularly for defects e.g. cracked or damage insulation, damage plugs, broken handles etc. and where defects are found; the tool should be removed from use and tagged until suitable and sufficient repairs are carried out.
- Hand tool must be inspected at least once every 6 month and a record kept of the findings of the inspection. Where there is more than one of the same type of hand tools, a unique serial number should be placed on the tools to differentiate between them.

19.13.2 Confines Spaces

The following procedures provide guidance on the precautions to be followed when assigning employees to work in confined spaces:

- Where practicable, conduct test to determine the quality of the air before permitting persons to enter any confined space.
- A permit to work should be prepared prior to the commencement of the work.
- Ensure that workers are provided with the required safety equipment (extractor and ventilation fans, breathing apparatus, safety harnesses and rope etc.).
- Where works such as cleaning is required and lighting would have to be used, do not permit employees to enter vessels with electrical cords and bulbs rated above 24 volts.
- Take care to ensure that employees are not allowed to work alone.
- Close supervision should be provided for the duration of the task.

19.13.3 Cranes, Rigging and Lifting Operations

In an effort to prevent injury to persons and to protect property from damage, the following guidelines should be followed during lifting:

- All cranes, lifting tackles, wire ropes, chains and cleats must be inspected daily for defects.

- The safe working load which the device can lift must be clearly posted on the equipment including the chains and wire ropes.
- All wire rope chains and lifting tackles must be stored in the approved manner.
- No worn rope or chain should be used where there is a visible signs of wear e.g. elongated eyes and strands.

19.13.4 Working at Heights

Whenever work would have to be performed at heights above 2 meters the following safety precautions must be taken:

- Suitable and sufficient access equipment (ladders, scaffold and safety nets) should be provided.
- Where necessary, provide roof ladders for workers to use in the execution of roof work.
- Suitable and sufficient harness and anchor ropes should be provided and workers should be trained in their correct use.
- Suitable anchor points should be established and anchor ropes tied as close as possible to restrict the free fall.

19.13.4.1 Perimeter Guard Rails

Guard rails may be used to provide effective fall prevention:

- At the edges of roofs
- At the edges of floors, walkways, stairways, ramps and landings
- On top of plant and structures where access is required
- Around openings in floor and roof structures.
- At the edges of shafts, pits and other excavations.
- Guard rails should incorporate a top rail of 1100 mm a mid-rail of 750 mm and a toe board of 100 mm above the working surface.

19.13.4.2 Elevating work platforms

Elevating Work Platforms (EWPs) include scissor lifts, cherry pickers, boom lifts and travel towers. There are battery powered and internal combustion engine types. Some are designed for hard flat surfaces only, while others are designed to be operated on rough terrain. Safety considerations include that:

- workers operating the platform are trained and instructed in safe operating procedures for the particular brand and type of equipment, as well as the safe use of fall-arrest equipment and emergency rescue procedures
- the platforms are only used as working platforms and not as a means of entering and exiting a work area unless the conditions of Cranes, hoists and winches - Safe use - Mobile elevating work platforms are met

- Unless designed for rough terrain, the platforms are used only on a solid level surface
- The surface area is checked to make sure that there are no penetrations or obstructions that could cause uncontrolled movement or overturning of the platform
- workers are licensed when operating boom-type elevating work platforms with a boom length of 11 meters or more

19.13.4.3 Safety mesh/nets

Safety mesh/nets are designed to prevent internal falls through a roof and external falls off the sides of buildings when working at heights. If securely fixed, safety mesh provides fall protection for roof installers and offers long-term protection against falling for maintenance and repair workers.

As such, GPL would require that contractors working at such heights and location should ensure that safety mesh/nets are in use.

19.13.5 Manual Handling and Lifting

GPL shall require that contractors ensure that safe systems of work are adopted to mitigate the risk of manual handling injury. This may include:

- Identifying manual handling risks and implementing adequate controls
- Using mechanical means wherever it is reasonably practicable.
- Sound purchasing and procurement practices.
- Appropriate training for employees in proper lifting technique.

19.13.6 Electrical

GPL shall require that contractors ensure that the use of electrical wiring, portable tools and extension leads complies with applicable Codes of Practice or conformance to the provisions of Building Code: Section 4 Electrical Code Guide, Wiring Rules.

19.13.6.1 Inspection and Tagging

All electrical leads, portable power tools, junction boxes and earth leakage devices shall be tested and inspected by a suitably qualified person. The item shall be labelled with a tag of current date before being brought on site. A record of the current of all electrical equipment will be recorded on an electrical equipment register. The inspection frequency is 6 months.

19.13.6.2 Selection and Use

GPL also would require that contractors subscribe to the following:

- Whilst on site any electrical equipment found without a tag of current date issued by a suitably qualified person shall be placed 'out of service'.

- Where an electrical item is located without a current inspection and test tag, proof of the electrical items compliance shall be provided or the item removed from site immediately.
- When used on site all equipment shall be connected to a residual current device.
- Extension leads shall not be joined together.
- Electrical equipment shall not be placed on or near wet areas unless the equipment is designed for the specific purpose (e.g. pumps).
- Where electrical equipment is hired, the contractor shall ensure that the same site requirements apply.

19.13.7 Fire Prevention

Contractors must have a Fire Prevention Plan for preparedness in the event of an occurrence. Requirements for such plan are listed below:

- A fire prevention plan must be in writing, be kept in the workplace, and be made available to employees for review. However, an employer with 10 or fewer employees may communicate the plan orally to employees.
- A list of all major fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard;
- Procedures to control accumulations of flammable and combustible waste materials;
- Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials;
- The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires; and
- The name or job title of employees responsible for the control of fuel source hazards.

An employer must inform employees upon initial assignment to a job of the fire hazards to which they are exposed. An employer must also review with each employee those parts of the fire prevention plan necessary for self-protection.

19.13.8 House Keeping

Good housekeeping refers to the practice of keeping your site clean and tidy. A tidy work area reduces the risk of accidents and improves fire safety. Good housekeeping also improves productivity, since storage of all equipment and materials are done in a systematic manner making such readily retrievable.

The minimum requirements to maintain a good standard of housekeeping are:

- There must be designated area for all waste which should also be sorted by type.

- Storage of materials and equipment should be in a systematic and safe manner. Storage should also allow for safe and unobstructed access.
- Progressive and frequent cleaning of work area to remove potential hazards should be practiced.
- Avoid trailing cables and other risk such that can create as trip hazard.
- Inform all of present dangers and advise accordingly.

19.13.9 Out of Service Equipment

When equipment is broken and needs repair, it is highly important to eliminate the risk of the person performing the repair becoming injured or the equipment becoming further damage from accidental start up. As such, tags indicating “out of service” are usually placed on the equipment and their starters to ensure that accidental start-up do not occur. These tags usually yellow or red in color and is used to warn persons that the equipment is out of service and should not be operated. Whenever such tags are posted, only a Supervisor should be permitted to remove such tags after verifying that the machine is safe to return to operation. Where necessary, tags are sometimes used in conjunction with locks to further reduce the chance of accidental startup of a machine. This is commonly referred to as the lock out/tag out system.

19.13.10 Personal Protective Equipment (PPE)

The OSH Act mandates that employees be provided with suitable PPE for their protection whilst they are at work. Making the workplace safe includes providing instruction, procedures, training and supervision to encourage people to work safely and responsibly. Determining the type of hazards associated with a job and the PPE needed to mitigate any risk and is usually determined by a risk assessment. Training employees in the correct use of PPE is also a critical part in ensuring that employees remain safe whilst at work. It shall be the responsibility of the Contractor to ensure that all its employees use the PPE provided to them; and in the correct manner.

19.13.11 Signs and Barricades

Safety Signs provides warning of the existence of hazards in the work place and to convey critical information about an operation to employees. These can be temporarily or permanently affixed to the locations where hazards exist. Signs convey both general and specific messages by means of words or symbols and must be visible at all times when work is being performed. The following provides a general guideline on the color of safety signs and their meaning:

- Signs painted in yellow or orange is used to indicate that caution should be taken.
- Safety signs painted in red are usually used to indicate emergency equipment such as fire points, or to draw persons attention to a source of danger.
- Safety signs painted in green are usually used to indicate the presence of emergency equipment such as emergency eye wash station and shower, first aid station.
- Safety signs painted in blue is used to indicate that certain protective devices are mandatory such as the use of ear muffers or safety glasses in some areas.

Barricades on the other hand is used to restrict access to a specific or general part of a workplace and can take the form of an actual barrier or could be in the form of a danger or caution tapes. Barricades are used as a means of isolating persons from the source of danger. In an effort to be effective, barriers are sometimes used in conjunction with safety signs especially in areas where there is the risk of serious injuries or damage to equipment, property or the environment.

19.13.12 Vehicles and Mobile Equipment

The Contractor shall ensure that all plant and equipment is regularly inspected and maintained in accordance with a legislative and manufactures requirements. All mobile plant shall be inspected daily prior to commencement of shift with a daily pre-start inspection completed and retained. All faults are to be noted and reported to the GPL personnel with oversight of the project/contract. Any fault that may cause the plant to be unsafe, damage the plant or cause environmental harm will require the plant to be tagged out of service and repaired.

19.13.13 Welding and Cutting

All welding and cutting operations shall be carried out in a manner, which will maintain:

- The health and safety of personnel directly engaged in the work, their work mates and other nearby persons
- The safety of near-by-plant and equipment. Depending on GPL requirements, hot work permits will be required when hot work is to be conducted in hazardous condition.
- Suitable fire safety arrangements shall be in place e.g. fire watch, adequate extinguisher and sand buckets.
- Screens or barricades to protect other employees from arc flashes.
- Adequate PPE for the welders and their helpers including face shields, gloves, sprats, sleeve and aprons.
- Suitable and sufficient means of ventilation shall be provided for welders and where this is not practicable, frequent breaks should be allowed.

19.13.14 Ladders

Any person using a ladder shall inspect it prior to use.

- Any ladder with damaged rails, rungs or joints shall be removed from site. All ladders shall have non-skid feet.
- Ladders shall only be used on a stable base and the areas at the top and bottom of the ladder kept clear of obstructions
- Extension ladders shall be placed against walls with a height to base ratio of approximately 4:1, and secured at the top, and reach at least 1 meter above the point to be accessed.
- Only Platform ladders may be used to work from provided they are fully enclosed

RECEIVED BY:.....

NAME OF CONTRACTOR:.....

CONTRACT NAME AND NO.:.....

DATE:.....

20 Risk Assessment Checklist



Subject/Area:.....
 Assessment:.....

Date of Risk

Type of Work / Location

YY / MM / DD

What are the hazards	Who might be harmed and how?	What are you already doing?	What further action is necessary?	Action by who?	Action when?	Done by

.....
GPL Personnel

.....
Contractor

21 EMPLOYERS REQUIREMENTS

21.1 DESCRIPTION OF THE PROJECT

The project shall result in a New **Modular Power Plant (hereinafter referred to as “Plant”)** designed for base load operation and is intended for power generation. The total net capacity will be **25MW ± 5%** at ISO 8528 conditions.

For clarity, New **Modular Power Plant** shall be defined as a power plant that has never entered into commercial operation since manufactured.

The Plant will be of proven type, designed to use heavy fuel oil (HFO) as the main fuel. The Gross Power Output shall be measured at generator terminal, excluding auxiliary consumption.

21.1.1 The Plant shall be constructed on either: (1) site contiguous to the existing Power Plant Compound located at Canefield, East Berbice, or (2) site adjoining 69/13.8kV Substation, Columbia, Mahaicony, East Coast Demerara. Both sites are shown on the Google Earth Maps (Drawing # 01 & 02). The scope shall be executed by an EPC Contractor working under a Lump Sum Turn Key (LSTK) Contract. The Plant shall be connected to the existing 69/13.8kV Substation at either locations and the interconnection done by GPL.

21.1.2 The works under this scope include the complete design, engineering (**including supply of all calculation and settings**), manufacturing, inspection, testing, supply, delivery to the site, construction, erection, installation, testing & commissioning, and training of GPL personnel for the first six **(6)** months after Plant acceptance under a LSTK contract.

21.1.3 The EPC Contractor shall be responsible for site survey, soil testing, studies of cooling and process water availability, and environmental impact assessment studies.

21.1.4 The design must be fully compatible with the existing equipment and operating requirements and not adversely affect the performance of any existing interconnected power systems. The required power plant shall be industrial that can black start and control the voltage and frequency.

21.1.5 This Plant shall have an aggregate output of 25 MW ± 5% @ 0.8 PF, 60HZ, and 13.8k V. The generators will consist of multiple units and associated auxiliary equipment, storage etc. for safe, reliable and efficient operation. The generating sets/engines [reciprocating piston engine) supplied for this project will consist of engine generators using Heavy Fuel Oil [HFO].

21.1.6 An incinerator for the burning of generated sludge shall also be provided in the design.

21.1.7 The plant shall be built with due consideration to the following:

- Prevailing Health and Safety Regulations.

- Prevailing Environmental requirements.
- Design features to be compliant with permitting and regulatory features.

21.2 STATEMENT OF WORK

The general scope of work includes but not limited to the following areas:

- 21.2.1 Land surveying and Geotechnical engineering
- 21.2.2 Engineering, Procurement and Construction of foundations. All major foundations shall be so designed to accommodate the required loads.
- 21.2.3 Engineering, Procurement and Construction of facilities to house the generators, control room, administrative office and staff common room including restrooms.
- 21.2.4 Engineering, Procurement and Construction of the plant structures and equipment.
- 21.2.5 Engineering, Procurement and Install the plant mechanical, electrical and auxiliary equipment.
- 21.2.6 Engineering, Procurement and Construction of the fuel system, cooling system, fire protection system, bulk storage tank (3000 cubic meters) with heating and other auxiliary systems.
- 21.2.7 Engineering, Procurement and Construction of the guard hut, drainage and sewage systems, internal roads, area and boundary lighting and boundary fence.
- 21.2.8 Testing and Commissioning of the plant
- 21.2.9 Development and submission of including but not limited to: Shop Drawings, O&M manuals, and As-Built drawings.
- 21.2.10 Provide six (6) months training for GPL personnel after plant acceptance.
- 21.2.11 Provide all required standard maintenance tools, equipment and spares during warranty period twelve (12) months after plant acceptance.

21.3 PLANT CIVIL WORKS

The EPC Contractor shall be responsible for:

- 21.3.1 Site development including site leveling, filling to the final elevation and soil compaction.
- 21.3.2 Engineering, Procurement and Construction of all foundations. All major foundations shall be adequately designed to accommodate required loads.
- 21.3.3 Engineering, Procurement and Construction of all structures including but not limited to control room and engine house.
- 21.3.4 Engineering, Procurement, Construction and installation of all major and auxiliary structures including but not limited to radiator, stack, tanks, boiler etc.
- 21.3.5 Engineering, Procurement and Construction of the fuel system, fire protection system, cooling system, bulk storage tank and other auxiliary systems.
- 21.3.6 Engineering, Procurement and Construction of all site works including but not limited to drainage and sewage systems, internal roads, area and boundary lighting, guard huts, and boundary fence.

21.4 PLANT MECHANICAL WORKS

- 21.4.1 The EPC Contractor shall be responsible for Engineering, Procurement, Testing and Installation of all major and auxiliary plant equipment.
- 21.4.2 The EPC Contractor shall be responsible for Engineering, Procurement, Construction, Testing and Installation of all station support systems including but not limited to oily water, water treatment, heat recovery, exhaust, cooling, compressed air, fuel system, fire protection system and other auxiliary systems.

21.5 PLANT ELECTRICAL WORKS

- 21.5.1 The EPC Contractor shall be responsible for Engineering, Procurement, Construction, Testing and Installation of all Electrical works including but not limited to a 60MVA 69/13.8kV Generator Step Up Unit (GSU) - See Appendix 1, 13.8kV switchgear, control and protection, cabling and grounding, DC power supply, and lighting and small power supply system.
- 21.5.2 The EPC Contractor shall be responsible for Engineering, Procurement, Construction, Testing and Installation of all communication facilities and office equipment.

21.6 DESIGN

The EPC Contractor shall be required to submit drawings and engineering data in accordance with the Schedule and requirements herein to assure compliance with the overall design and construction schedule.

21.7 SHOP DRAWINGS

21.7.1 The Contractor shall submit to the Project Manager for review and approval, three (3) copies of all shop and site erection work drawings in a scale of 1:4.

21.7.2 Review and approval by the Project Manager shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory and that the Project Manager's review or approval shall not relieve the Contractor of any of his responsibilities under the Contract

21.8 TESTS

21.8.1 The Contractor shall be responsible to all testing of equipment and systems supplied under this contract. The Contractor shall submit with his proposal a list of those tests, which in his opinion will satisfactorily check the operating characteristics of the equipment and determine all values necessary for evaluation of guarantees.

21.8.2 In the event of an award of contract, the Contractor shall submit within sixty (60) days of the date of notice of award details of the proposed procedures for each test. All test procedures shall be subject to the GPL's modification and approval.

21.8.3 For startup and test, GPL shall supply operating staff that shall operate the equipment as directed by the Contractor under the Contractor's responsibility.

21.9 COMMISSIONING

21.9.1 The Contractor shall be responsible for the commissioning of all equipment in his supply, and shall provide necessary commissioning engineers to carry out all operations from first making alive of auxiliary equipment until the full commissioning has been completed.

21.9.2 The schedule shall cover all necessary inspections, adjustments and tests from no load to full rated capacity.

21.9.3 GPL shall provide operating and maintenance staff to gain familiarity with the installation but the Contractor shall remain fully responsible for safe operation of all equipment in his supply during the commissioning periods, and until the completion certificate have been issued.

21.10 OPERATIONS & MAINTENANCE SUPERVISION & TRAINING

- 21.10.1 The Contractor shall be responsible for training of GPL personnel for the first six (6) months after Plant acceptance under a LSTK contract.
- 21.10.2 The Contractor shall provide adequate competent staff during the training period. Contractor shall provide unit rates for staff during this period.
- 21.10.3 The Contractor shall be responsible for the execution of all inspections and overhauling of the engines and other major equipment during the eighteen months warranty period.
- 21.10.4 The contractor shall be responsible for the first major overhaul which may be required during the warranty period, and shall provide training for GPL personnel during this exercise.

21.11 OPERATIONS & MAINTENANCE MANUALS

- 21.11.1 The Operation and Maintenance Manuals shall include full instructions for the operation, servicing and maintenance of the Plant, not only during the period of the Contractor's liability but more particularly during its operating life.
- 21.11.2 The directions shall be set out simply, clearly and systematically. This may be divided into two volumes if desirable, one for operation and the second for servicing and maintenance (in sub-volumes for major items of Plant).
- 21.11.3 The operational data shall include a complete physical and functional description of the Plant (in sub-volumes for major items of Plant) and step-by-step procedures for inspection, checking and adjustments for proper operation of the Plant.
- 21.11.4 The maintenance data shall include complete instructions for routine checks, servicing, maintenance and repair of all parts and for dismantling, handling and re-assembly of all equipment, sub-assemblies and all separate components. The maintenance data shall also include where possible parts catalogues. The lists shall provide all necessary information for identifying the parts and for re-ordering the parts including name of part, part number and catalogue references where applicable, name of manufacturer, size, capacity and other characteristics .
- 21.11.5 General arrangements, single line diagrams and detailed drawings shall be provided for ready reference in the operation and maintenance instructions.
- 21.11.6 The manuals shall be printed on ISO paper size A4 (210x297 mm) with offset or equivalent printing strongly bound in a durable stiff cover bearing the title in approved legend. Drawings shall be folded or reduced to 297 mm height. All volumes shall bear on the spine an approved shortened version of the title.
- 21.11.7 The Contractor shall submit three (3) draft copies for approval of the Project Manager prior to producing finished volumes.

21.11.8 The Contractor shall provide six (6) copies and two (2) electronic copies of the approved Operation and Maintenance Manuals prior to Taking Over by the Employer. Supplementary Operation and Maintenance Manual shall be provided by the Contractor, if required, to incorporate changes resulting from experience during the operation and maintenance period. The work shall not be considered to be completed for the purpose of taking over until such manual and drawings have been supplied to the Employer.

21.12 AS-BUILT DRAWINGS

The Contractor shall furnish to the Project Manager four (4) copies and one (1) reproducible of approved quality of all "As-Built" drawings within the period mentioned in the Preamble to Conditions of Contract. All drawings shall also be provided in an electronic form (CD).

21.13 SPARES & CONSUMABLES - WARRANTY PERIOD

21.13.1 Contractor shall obtain in the name of the Guyana Power & Light Inc., warranties from the original equipment manufacturer for the four (4) year period following the completion of the twelve (12) months warranty.

21.13.2 The Contractor shall submit a list of spare parts with Original Equipment Manufacturer (OEM) Part No. and consumables (lube. oils, greases, air & oil filters, chemicals etc.) to be necessary for day to day operation and maintenance of the generating unit and other plant equipment inclusive of emergency use that takes place in the course of operation (according to the Manufacture's recommendation and guideline) during the Warranty period twelve months (12). During the warranty period of 12 months, the Contractor shall supply all necessary equipment, spare parts, materials and consumables (except HFO fuel) etc. at Contractor's own cost and whether it is listed or not in their list.

21.14 TOOLS & EQUIPMENT

21.14.1 SPECIAL MAINTENANCE TOOLS

The Contractor shall provide all special tools required for maintenance of the unit and hand them over in good condition to the Guyana Power & Light Inc. A list of all such tools shall be incorporated with Bid. Contractor shall not be permitted to use any equipment/ machinery/ tools, which are to be supplied under the Contract.

21.14.2 ELECTRICAL WORKSHOP TOOLS

Contractor shall provide all tools for the electrical workshop including but not limited to; Current injection test set, Megger, Multimeter.

21.14.3 MACHINE SHOP EQUIPMENT & TOOLS

Contractor shall provide all tools for the machine shop including but not limited to; Pillar drill, Machine hacksaw, Grinding Machine, small universal machine tools, Welding set and steam jenny.

21.14.4 CHEMICAL LABORATORY EQUIPMENT & TOOLS

Contractor shall provide all Chemical Laboratory Equipment & Tools including but not limited to; shall include among others all necessary equipment & Tools for oil testing, water testing and testing of chemicals used in the power plant.

21.14.5 OFFICE EQUIPMENT

The Contractor shall provide Computers (latest model), each with Laser Printer, UPS (30 Minutes at full load, Min.), Stabilizer, Standard Tables & Chairs etc.

21.15 PERSONNEL

All key personnel on the project must be able to fluently understand, speak, read and write the English language.

21.16 PRE BID MEETING

The Bidder or its official representative are invited to attend a virtual pre-bid meeting.

21.16.1 The purpose of the pre-bid meeting will be to answer any questions the Bidders may have concerning this Bid Document as well as to enable the Bidders to hear the answers to questions raised by other Bidders. This open forum is designed to ensure that all bidders have access to the same information.

21.16.2 Questions raised at the pre-bid meeting for which answers are available shall be answered at that time. Answers to the other questions shall be provided within the fourteen days response period.

21.16.3 Any modification of this Bid Document which may become necessary as a result of the pre-bid meeting shall be made by GPL exclusively through the issuance of an Addendum posted along with the response of GPL on the website of GPL.

21.17 PHYSICAL FACILITIES OF THE PROJECT

The Project consists of a New Modular Power Plant with HFO fired engine generator set of 25 MW of net capacity at ambient site conditions with all the required support facilities, which among others, would include the following:

- 21.17.1 Complete 25MW \pm 5% HFO fired Modular Power Plant generation unit with a total net power generation capacity of 25 MW at ISO 8528 conditions, expected to operate based on economic dispatch with an annual availability factor of not less than 95%.
- 21.17.2 All required site support facilities including, but not limited to fuel delivery and storage facilities, and cooling and process water systems.
- 21.17.3 All necessary site infrastructures such as lighting etc.
- 21.17.4 Control room equipped to operate the plant in conjunction with the existing unit.
- 21.17.5 The Bulk Fuel Storage facility shall be designed with heating mechanism.

21.18 MAJOR PLANT ITEMS OF THE SCOPE

21.18.1 GENERAL

Contractor shall design, engineer, inspect, test, supply, deliver to the site, construct, erect, installation, test & commission included but not limited to the following major items. Contractor shall also be responsible for training of GPL personnel for six (6) months after plant acceptance in relation to the items of the scope.

21.18.2 GENERATING SETS

- a. Engine
- b. Generator
- c. Base Frame including:
 - i. Common base frame engine part
 - ii. Common base frame generator part
 - iii. Set of fastening equipment
- d. Elastic Mounting – Steel Springs
- e. Flexible coupling
- f. Flexible connections between the engine and external piping
 - i. Set of flexible hoses and gaskets
 - ii. Set of cooling water bellows
 - iii. Exhaust gas bellows
 - iv. Charge air bellows compensator
- g. Engine maintenance platform (prefabricated)
- h. Containers shall be designed for easy access for maintenance.

21.18.3 MECHANICAL AUXILIARY SYSTEMS

- a. Engine Auxiliary Module with integrated compact booster including:
 - Fuel oil filter
 - Fuel booster pump

- Return fuel pump
 - Fuel oil cooler
 - Lubricating oil cooler
 - Pre lubricating oil pump
 - Pre heating unit
 - Pressure increasing pump
 - Steam heater piping and insulation
 - Valves and gauges
 - Module control panel
 - Lubricating oil automatic filter
 - Thermostatic valve lubricating oil back-up cooler
 - Thermostatic valve high temperature water system
 - Thermostatic valve low temperature water system
- b. Exhaust Gas Module
- Low temperature expansion tank
 - Charge air silencer
 - Exhaust gas branch pipe
 - Piping and insulation
 - Oil mist separator
- c. Pipe Rack

21.18.4 FUEL SYSTEM

- a. Light Fuel Oil System (LFO)
- Oil unloading pump unit
 - LFO transfer pump unit
 - Day tank equipment
 - Piping and valves for LFO system inside engine hall
 - Piping and valves for LFO system outside engine hall
 - Flow meters (mass)
- b. Heavy Fuel Oil System (HFO)
- HFO transfer pump unit
 - HFO buffer tank insulation
 - HFO buffer tank equipment
 - HFO separator unit – Separator, delivery pump, strainer, steam heater, sludge tank, sludge pump, steel frame, control panel, interconnection pipes, flanges, seals and valves.
 - HFO/LFO feeder unit - HFO feeder pump, LFO feeder pump, Automatic filter, Manual by-pass filter and Viscosity control system
 - Piping and valves heavy fuel oil system inside engine hall
 - HFO trace heating material inside engine hall
 - HFO pipe insulation inside engine hall
 - Piping and valves heavy fuel oil system outside engine hall
 - HFO trace heating material outside engine hall

- HFO pipe insulation outside engine hall
- Flow meters (mass)

21.18.5 STATION SUPPORT SYSTEM

a. Lubricating Oil System

- Lubricating oil separator unit
- Lubricating oil unloading pump unit: fresh oil
- Lubricating oil storage tank: fresh oil
- Equipment for lubricating oil storage tank: fresh oil
- Lubricating oil service tank equipment (flow meter, level indicator)
- Lubricating oil transfer pump unit (mobile)
- Lubricating oil transfer pump unit (stationary)
- Lubricating oil storage tank: used oil
- Lubricating oil unloading pump unit: used oil
- Equipment for lubricating oil storage tank: used oil
- Piping and valves lubricating oil system inside engine hall
- Lubricating oil system pipe insulation inside engine hall
- Piping and valves lubricating oil system outside engine hall
- Lubricating oil system pipe insulation outside engine hall
- Flow meters (mass)

b. Compressed Air System

- Starting air bottle
- Starting air compressor unit – double
- Starting air compressor unit - single
- Instrument air compressor unit
- Instrument air bottle
- Piping and valves compressed air system (set)

c. Cooling System

- Cooling radiator and auxiliaries
- Maintenance fresh water tank unit
- Piping and valves maintenance water system (set)
- Piping and valves cooling system inside engine hall
- Piping and valves cooling system outside engine hall

d. Charge Air System

- Charge air filter
- Ducting charge air system (set)

e. Exhaust System

- Exhaust gas silencer and bellows
- Ducting exhaust gas system (set) and bellows for ducting
- Insulation exhaust gas ducting (set)
- Exhaust gas stack pipe

f. Oily Water System

- Oily water transfer pump units

- Oily water buffer tank
 - Oily water feed pump unit
 - Oily water treatment unit Sludge tank
 - Sludge loading pump unit
 - Piping and valves oily water treatment system (set)
 - Sludge disposal
- g. Water Treatment System
- Water treatment unit
 - Treated water storage tank
 - Water booster unit
 - Piping and valves treated water system (set)
- h. Engine Fire Fighting System
- All necessary onboard firefighting equipment.

21.18.6 BLACK START UNIT

21.18.7 Supply and install one (1) emergency diesel generating set of adequate capacity (pf 0.80) complete with ancillary equipment and having diesel storage capacity for 8 hrs. continuous operation for supplying power to essential auxiliaries to start at least one (1) unit in case black start. EDG shall be of automatic starting system including quick start & loading capability. The starting system shall be capable of carrying out at least five (5) consecutive starts without auxiliary power supply.

21.19 AUXILIARY PLANT ITEMS OF THE SCOPE

21.19.1 FIRE FIGHTING & PROTECTION

Supply and install foam based fire-fighting facilities.

Supply and install hydrant system, including but not limited to; water main,

hydrant stands, hoses, motor driven and engine driven firefighting pumps and jockey pump

Supply and install portable fire-fighting equipment

21.20 CIVIL ENGINEERING WORKS

21.20.1 STATEMENT OF WORKS

The civil works shall include collection of site data, detailed design, production of working drawings, shop drawings and as-built drawings, provision of labour, supply of construction plant and materials, construction and rectification of defects during the Warranty Period of the Works.

21.20.2 SCOPE

The Scope of Work shall include, but not be necessarily limited to, the following:

21.20.2.1 Temporary Works:

Works necessary to construct the permanent works. Provision of site office, including all services, furnishings, and attendance for the period required by the Project Manager but not exceeding one month after the final taking-over date.

21.20.2.2 Site Works:

Excavation and filling of the Site to formation level including running surplus excavated materials to disposal area, underground and surface drainage, internal and access roads, water supply, sewage treatment, cable ducting, pipe ducting, landscaping and gravel surfacing, area lighting, fencing, boundary wall and gates.

21.20.2.3 Foundation:

For all plants and structures supplied under this Contract. Suitable foundations shall be provided for the engine generating unit, transformer, elevated water tank, lube oil storage tank, LFO storage tank, HFO storage tank, fuel oil handling system, emergency diesel generator (EDG), and all other equipment and structures.

21.20.2.4 Structures:

Works necessary to construct/erect the permanent structures.

21.21 TECHNICAL SPECIFICATIONS

21.22 POWER PLANT DESIGN REQUIREMENTS:

Bidders shall provide detailed specifications and shall be required to consider the Plant layout and design given to satisfy but not limited to the following requirements:

- 21.22.1 The Power Plant shall be able to generate and feed into the National Grid as a base load plant.
- 21.22.2 The design shall be fully compatible with any existing equipment and operating requirements. The design or layout must not adversely affect the performance of any existing interconnected power system.
- 21.22.3 The design and arrangement of plant, particularly the generating sets and all fuel and related facilities to be installed as required, shall be such that the number of hazardous areas are minimized. Hazardous area classifications shall be specified and shall be in accordance with international classification codes for hazardous area installations. All electrical equipment, instrumentation and control associated with the Heavy fuel oil handling plant shall be suitable for installation in a hazardous area.
- 21.22.4 Noises generated shall be at minimum level: ≤ 85 dB at distance of 1 meter from the engine house.
- 21.22.5 The modular enclosures shall be of adequate size, height and constructed of fire resisting materials and ventilated to the open air with industrial motorized ventilation fans. The enclosure shall have adequate lighting both the inside and outside.
- 21.22.6 The generating set shall be installed with fire detection, alarm system with an automatic fire suppression apparatus and placement of portable fire fighting extinguishers on all areas prone to fire risk.
- 21.22.7 The Bidder shall have the duty and responsibility to ensure health, safety and welfare of persons engaged at the site in accordance with relevant International standards, Government of Guyana ordinances and rules in force, including observance of Guyana Power and Light Inc. safety policy/rules.
- 21.22.8 All cables that are running on the engine and all hot surfaces shall be heat and oil resistant.
- 21.22.9 All underground and trenched cables shall be armoured cables.
- 21.22.10 Lighting – Internal & External: Adequate lighting of Internal and external of the power plant including all remote auxiliaries shall be installed throughout, and at minimum the external surrounding shall have sufficient neon power lighting.
- 21.22.11 The generating set and associated equipment shall be accompanied with all necessary facilities for ease of maintenance and operation including the following:
- 21.22.12 Electric overhead crane wherever possible.
- 21.22.13 All outdoor auxiliaries shall be housed or fully enclosed.
- 21.22.14 The Generators shall be Skid Mounted for ease of installation and transferring when necessary.

21.23 GUARANTEE CONDITIONS:

21.23.1 The Contractor shall guarantee the net output and heat rate of the plant in keeping with;

- a. ISO 8528 Standards
- b. Generation voltage : 13,800 V
- c. Power factor : 0.8 lagging to 0.95 leading
- d. Frequency : 60Hz
- e. Operating Fuel : Heavy Fuel Oil (up to 700cSt)

21.23.2 The contractor shall guarantee the starting reliability of the Units including all ancillary equipment. The guaranteed reliability shall be stated in the Bid form together with the number of consecutive starts to which the Units will be subjected to demonstrate this reliability. (This is for a starting reliability of 95 %, the Units shall be subjected to 20 consecutive starts of which 19 shall be successful) the maximum speed rise after full load rejection is to be guaranteed.

21.24 CODES AND STANDARDS:

The following is a selection of codes, technical standards and guidelines which are concerned with the design and installation of the plant. Design and installation shall comply with but not limited to the selection of guidelines, codes and technical standards.

21.24.1 MECHANICAL SYSTEMS

- Engine Test run ISO 15550
- Vibrations ISO 8528 part 9
- Design EN12100
- Pipe design calculation EN13480 and DIN 2413
- Welding EN1011
- Stair and platforms ISO
- Dimensional standards for Installation materials DIN, ISO, SFS and EN
- Vertical tanks API 650 or EN 14015
- Horizontal tanks EN12285 Excluding nozzle location
- Pressure Equipment PED97/23/EC
- Typical material standard DIN, SFS, and EN

21.24.2 ELECTRICAL SYSTEMS

- Generator IEC 60034
- Transformer, Oil type IEC60076
- Transformer, Dry type IEC60076
- MV Switchgear IEC 62271-200 or IEC 62271

- LV Switchgear IEC 60439-1
- Enclosure protection IEC 60529
- Workstation hardware IEC 60950
- Earthing network IEEE 80
- Control panels IEC 60439-1
- PLC Software IEC 61131-1
- Lighting installation IEC 60598
- Fire detection EN 54
- Protection of structures against lightning IEC 62305-1

21.25 POWER GENERATION EQUIPMENT:

21.25.1 GENERATING SET

The engine generating unit shall be of well proven design and the offered model shall have satisfactory operating experience outside manufacturer's country for at least two (2) years. Bidder shall have to submit at least one certificate (must be from outside manufacturer's country) from the end users in this respect. This certificate must be notarized or have authentication from the Chamber of Commerce of the Bidder's country or the Embassy/High commission of the end user's country situated in Georgetown, Guyana.

21.25.1.1 The generating set shall comprise the engine and generator mounted on a common base frame which allows flexibility by means of steel springs.

21.25.1.2 Other technical specifications such as physical size, weight etc. is to be provided by the design contractor.

21.25.1.3 The Generating set type, size and quantity shall be complete with all necessary auxiliaries. The auxiliaries will include, but not be limited to, the following:

- a. Skid mounted generating sets complete with all auxiliaries, controls, couplings, etc., with acoustic measures (skid design shall be spring, rubber or combination).
- b. Exhaust stacks with silencers, aviation obstruction warning lights.
- c. Lubrication oil system, complete with all coolers, pumps, filters, controls, etc.
- d. Ignition, cooling and air systems.
- e. Emission Mitigation and Control Equipment to comply operation with international/local environmental regulations.
- f. Noise attenuation equipment.
- g. Thermal insulation and lagging.
- h. Heating, Ventilating and Air Condition (HVAC) and auxiliaries.
- i. High efficiency air intake systems with pulsed air cleaning, ductwork, dampers and filter element handling equipment/platforms.
- j. Drains of oil, wash water / chemicals, routed to suitable common drain and treatment systems.

- k. All necessary ductwork and cladding.
- l. All necessary anchor bolts, base plates and structural steel.
- m. All necessary platforms and ladders.
- n. All auxiliaries, controls and instrumentation.
- o. Fire fighting, detection, alarm and protection systems.
- p. Closed circuit cooling oil/water system with complete primary cooling water circuit and secondary air circuit including heat exchangers, pipe work, valves, etc.
- q. Heavy Fuel Oil (HFO) system skid with metering and filtering system, separators, pressure regulation valves, fuel heaters and isolation valves, etc.

21.25.2 ENGINE

1.1.

21.25.2.1 The engine unit shall be designed as a multi-cylinder, diesel cycle internal combustion one of the low/medium speed heavy-duty industrial type suitable for Heavy Oil firing and for continuous operation at any load between 30% -100% under the site conditions. The engine shall be of two/four stroke, direct injected, trunk piston, turbo-charged and intercooled design.

21.25.2.2 The radial amplitude of vibration of any rotating shaft under steady state conditions at normal operating shall conform to ISO 10816-6. The critical speed shall be beyond 20 % of the operating speed of the engine.

21.25.2.3 The engine unit shall be designed to burn Liquid fuel (Heavy Fuel Oil).

21.25.2.4 The unit shall be capable of frequent starts and stops without damage to the hot moving components and shall be able to operate as a base load unit.

21.25.2.5 The engine shall be capable of starting and stopping on Light Fuel Oil (LFO).

21.25.2.6 Engine components shall be designed, manufactured, constructed and installed in accordance to acceptable and applicable international standards (IEC, IEEE, EN, ISO etc.). The specifications and features of these shall be provided by the design contractor.

21.25.2.7 The specifications of all onboard systems; such as but not limited to Fuel system, Lube oil system, Charge Air system, cooling systems, Starting system, Exhaust Gas system, Speed & Load Regulating system, and instrumentation/ Automation systems, shall be described by the design contractor. All applicable standards shall be used in the design, manufacture, construction and installation of these systems to facilitate safe, maintenance friendly, reliable, efficient, durable and long lasting engines.

21.25.3 GENERATOR

1.2.

21.25.3.1 The generators shall be synchronous, three-phase, 60 Hz, 13800 kV, and be able to produce a total of 25 MW @ 0.8PF (min.) output. The generator shall have a high electrical efficiency, and capable of operating in parallel with the grid where the excitation is controlled by an Automatic Voltage Regulator (AVR) (Double for improved reliability) with a **compulsory functional Soft Start feature**.

21.25.3.2 The generators shall be air cooled, contain anti-condensation heaters, winding and bearing temperature sensors, current and voltage transformers for excitation, measurement and protection and designed to work with the supplied prime mover with a flexible coupling as the union.

21.25.3.3 Electric energy generating set:

- The total power plant shall be 25 MW +/- 5 % net at site condition (reference ISO 8528).
- Nominal Voltage: 13800 Volt
- **Voltage range:** Adjustable +/- 5 %
- Voltage setting: $13800/\sqrt{3}$ Volt
- **Voltage deviation:** +/- 0.5 % between no-load and full load.
- Power factor: 0.80
- **Frequency:** $60 \pm 1\% \text{Hz} \pm 1\%$ Automatic Voltage Regulator (AVR)
- **Speed:** ≤ 750 rpm: Maximum (750rpm)
- **Overload:** 10% of the Load for one (1) Hour
- Synchronous generator (Alternator) Output: Three phase
- **Speed:** ≤ 750 rpm
- Terminal voltage: 13.8kV
- Frequency: 60 Hz
- Power factor: 0.80
- Insulation class: F
- **Excitation:** Brushless (static) $\pm 1\%$ Automatic Voltage Regulator (AVR);

21.25.3.4 Generator Control Systems and Condition Monitoring with (allowance for automatic notification) all generator control facilities, metering and protection system is not limited to but must provide for the following:

- a) Generator Soft Start
- b) Phase currents I_1, I_2, I_3
- c) Voltage U_1, U_2, U_3
- d) Active / reactive power
- e) Power factor
- f) Frequency
- g) Tripping currents I_1, I_2, I_3
- h) Windings temperature
- i) Running hour
- j) RPM counter
- k) Complete with synchronizing facility of Generating sets

21.25.4 COMMON BASE FRAME FOR ENGINE AND GENERATOR

The base frame shall be of a strong rigid steel construction facilitating easy installation of engine and generator onto it and alignment of entire unit at site. It shall be built to accommodate steel springs for vibration damping and flexibility.

21.25.5 CONNECTIONS

There shall be flexible couplings for all connection to systems not located on the generating sets.

21.25.6 ENGINE PLATFORMS

Free standing maintenance platforms shall be provided to facilitate easy maintenance and access to the engines. These platforms shall conform to applicable safety standards.

21.26 MECHANICAL AUXILIARY SYSTEMS:

All necessary auxiliary equipment to facilitate the proper functioning of the generating sets shall also be supplied. The specifications of which shall be provided by the design contractor. These are, but not limited to the following:

21.26.1 AUXILIARY SYSTEM

The following shall be sized as necessary to facilitate the proper functioning of the two generator sets of similar capacity as described previously.

21.26.1.1 Engine Auxiliary

- Fuel oil filter
- Fuel booster pump
- Return fuel pump
- Fuel oil cooler
- Preheating unit
- Thermostatic valve for high temperature system
- Thermostatic valve for low temperature system
- Pressure increasing pump
- Steam heater
- Piping and insulation
- Valves and gauges
- Control panel

21.26.1.2 Exhaust System and Gas Auxiliary Equipment

The exhaust system shall be of flexible bellows, with exhaust chimney in single location to avoid spread of exhaust temperature and products. The length of the exhaust chimney shall be constructed so as to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a

result of atmospheric downwash, eddies, or wakes which may be created by the source itself, nearby structures, or nearby terrain obstacles. The detailed specifications shall be supplied by the design contractor. The exhaust and Gas Auxiliary system shall consist of but not limited to the following:

- a) Heat resistant manifolds
- b) Adapters
- c) Expanders
- d) Mufflers (noise must be fully contained)
- e) Control of gas emissions should conform to ISO standards to ensure environment conservation.
- f) All exhaust pipes and manifolds within the power house to be fully lagged with heat resistant insulators.
- g) Exhaust shall be of Optimal Design in such that heat and soot emission (on start-up) should not hit the power house roofing.
- h) Exhaust gas silencer of an appropriate design to attain suitable noise attenuation.
- i) Bellows for exhaust gas silencer of an appropriate design.
- j) Ducting exhaust gas system between the engine and exhaust gas stack of an appropriate design.
- k) Bellows for ducting exhaust gas system of an appropriate design.
- l) Exhaust gas stack pipe shall be of an appropriate size, height and constructed on an appropriate material.

21.27 FUEL OIL SYSTEM

The following should be adequately sized to facilitate the proper functioning of the generator set of similar capacity as described previously.

NB: The heavy fuel oil system scope begins from the fuel transfer pumps since bulk storage tanks with immersion heaters are in place. Provisions shall be made for a connection point to incorporate the fuel transfer pumps. A connection point will be determined on site.

21.27.1 HEAVY FUEL OIL (HFO)

The Heavy Fuel Oil (HFO) supply system shall include but not be limited to the following. The detailed specifications shall be supplied by the design contractor.

- 21.27.1.1 Two HFO transfer pump units electrically driven (One pump is set for operation and the other for standby) of an appropriate capacity with all necessary valves, pumps, filters, heaters, measurement, protection and control equipment etc.
- 21.27.1.2 Double HFO Separator unit of an appropriate capacity consisting of all necessary valves pumps, filters, heaters, measurement, protection and control equipment etc.
- 21.27.1.3 HFO Bulk Storage and Day Tanks should containing necessary level switches and sensors, gauges, valves and must be insulated etc.
- 21.27.1.4 HFO/LFO Feeder unit of an appropriate capacity with all necessary valves, pumps, filters, heaters, measurement, protection and control equipment etc.
- 21.27.1.5 Appropriate calibrate flow meter for total HFO consumption measurement.
- 21.27.1.6 Appropriate differential mass flow metering system for individual engine fuel consumption measurement.
- 21.27.1.7 Fuel booster unit of an appropriate capacity with all necessary valves, pumps, filters, heaters, measurement, protection and control equipment etc.
- 21.27.1.8 All necessary supply connecting pipes of the various sizes, flanges, gaskets, and valves.
- 21.27.1.9 All necessary connection pipes shall be heated using an appropriate trace heating method and insulated where necessary to minimize heat loss.
- 21.27.1.10 Remote level indication in the monitoring/control system, which shows fuel quantity by mass and in the tank in percentage.
- 21.27.1.11 All necessary controls, monitoring, instrumentation, protection, interlocks and safeguarding systems for all new equipment and systems shall be provided and shall be suitably interfaced, adapted and integrated with any existing systems.
- 21.27.1.12 Distributed Control System (DCS) for entire fuel supply and treatment section shall be provided in the Central Control Room.
- 21.27.1.13 Fire detection and protection system.
- 21.27.1.14 Complete detail labelling of all installations.
- 21.27.1.15 Sub-systems for proper handling of leaks and return fuel
- 21.27.1.16 Fuel Specifications: The HFO fuel will be supplied by the Employer and shall be as per the specifications shown in Table 1.

21.27.2 LIGHT FUEL OIL (LFO) SYSTEM

The Light Fuel Oil (LFO) supply system shall include but not be limited to the following. The detailed specifications shall be supplied by the design contractor.

NB: The LFO system scope begins from the fuel transfer pumps since bulk storage tanks are in place. Provisions shall be made for a connection point to incorporate the fuel transfer pumps. A connection point will be determined on site.

- 21.27.2.1 Light Fuel Oil (LFO) Unloading station consisting of appropriately sized pumps with the necessary filters, valves, pipes, measurement, protection and control equipment etc.
- 21.27.2.2 Appropriate flow meter for unloading measurement.
- 21.27.2.3 LFO transfer pump unit of an appropriate capacity with all necessary valves, pumps, filters, measurement, protection and control equipment etc.
- 21.27.2.4 LFO Day Tank should be appropriately sized containing heaters necessary level switches and sensors, gauges, valves etc.
- 21.27.2.5 Appropriate flow meter for consumption measurement.
- 21.27.2.6 All necessary supplied connecting pipes of the various sizes, flanges, gaskets, and valves.
- 21.27.2.7 All necessary connection pipes shall be heated using an appropriate trace heating method and insulated where necessary to minimize heat loss.
- 21.27.2.8 All necessary supplied connecting pipes of the various sizes, flanges, gaskets, and valves.

Table 1: HFO Specifications

Method	Test	Result	Units
ASTM	Density of Liquids by Digital Density Meter		
	Density @ 15°C	964.3	kg/m ³
	API Gravity at 60 deg F	16.7	*API
ASTM	Conversion of Kinematic Viscosity to		
	Saybolt Furol viscosity, 122 °F	127.2	SFS
ASTM D95	Water by Distillation		
	Water Content	0.30	Vol %
ASTM D93	Pensky-Martens Closed Cup Flash Point		
	Procedure Used	B	
	Corrected Flash Point	142	°C
ASTM	Sulfur Content in Petroleum Products by		
	Sulfur Content	0.686	%
ASTM D482	Ash from Petroleum Products		
	Ash	0.007	Wt %
ASTM	Micro Carbon Residue		
	Average Micro Method Carbon Residue	6.19	Wt %
ASTM	Asphaltenes (Heptane Insolubles)		
	Average Asphaltene Content	1.2	%m/m
ASTM D240	Heat of Combustion by Bomb Calorimeter		
	Gross Heat of Combustion	18811	BTU/lb

IP 501	Determination of Al, Si, V, Ni, Fe, Na, Ca, Zn, P in Fuel Oil - ICPES		
	Sodium	4	mg/kg
	Vanadium	10	mg/kg
	Nickel	28	mg/kg
	Aluminium + Silicon	< 15	mg/kg
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	-3	°C
ASTM 0473	Sediment by Extraction in Crude and Fuel		
	Sediment by Extraction	0.01	Mass %
ASTM D445	Kinematic Viscosity @ 50° C		up to 700cSt

21.27.3 FUEL TRANSFER SYSTEM

The plant have to be is equipped with a fuel transfer pump (screw type) to facilitate HFO transfer in between bulk storage and buffer tanks.

21.27.4 FUEL TREATMENT SYSTEM

21.27.5 HFO received from supplier shall go through a two-step treatment process and finally stored in the day tank for engine consumption. The first step takes place in the fuel storage tanks, which shall be equipped with heating and decanting facilities.

21.28 LUBRICATING OIL SYSTEM

The following should be adequately sized to facilitate the proper functioning of the generator set of similar capacity as described previously. The LO unit should be supplied with a control unit that supervises the entire operation of the separation system performing, monitoring control and alarm functions. The detailed specifications shall be supplied by the design contractor. The Lubricating Oil (LO) supply system shall include but not be limited to the following:

- 21.28.1 Lubricating Oil (LO) Separator designed for use with the supplied engine and of an automatic discharge type, consisting of all necessary pipes, valves, pumps, filters, heaters, measurement, protection and control equipment etc.
- 21.28.2 Lube Oil Separator cleaning unit with all necessary accessories (connections and cleaning liquids)
- 21.28.3 Two separate lube oil tanks for storing new lubricating oil and used oil. Lube Oil tank of an appropriate capacity consisting of all necessary valves, level sensors and gauges etc.
- 21.28.4 Mobile Lube Oil transfer pump unit of an appropriately sized pump with all necessary pipes, valves, gauges, filters and controls etc.
- 21.28.5 Stationary Lube Oil transfer pump unit of an appropriately sized pump with all necessary pipes, valves, gauges, filters and controls etc.
- 21.28.6 Sludge Lube Oil Tank of an appropriate capacity consisting of all necessary valves, level sensors and gauges etc.
- 21.28.7 All necessary interconnecting pipes, flanges, seals, valves etc to provide a functional system.

21.29 COMPRESSED AIR STARTING SYSTEM

This system shall consist of two compressor units and associated Storage bottles. The technical specification shall be provided by the designing contractor shall include but is not limited to the following:

2.

- 21.29.1 Starting air bottle of an adequate capacity to facilitate multiple starts of the two generator sets without being refilled. Designed pressure shall be issued by the contractor.
- 21.29.2 Starting Air compressor Unit shall be of the double type (two compressors mounted on the same base frame and electrical driven) and adequately sized to facilitate maintaining/refilling of the starting air bottle in reasonable time. All necessary pipes, flanges, seals, valves, oil/water traps, filters, measurement, protection/safety and control equipment etc. shall be included.
- 21.29.3 Instrument Air compressor Unit shall be adequately sized to facilitate maintaining/refilling of the Instrument air bottle in reasonable time. All necessary pipes, flanges, seals, valves, oil/water separators, filters, measurement, protection/safety and control equipment etc. shall be included. Compressed air system shall be configured so that the start air system can function as back up to instrument air system.
- 21.29.4 All necessary interconnecting pipes, flanges, seals, valves etc to provide a functional system.

21.30 COOLING SYSTEM

3.

21.30.1 The detailed specifications of the Cooling system shall be provided by the design contractor shall include but is not limited to the following: Cooling radiators of an adequate size of the horizontally and remotely mounted, stand alone, treated water type with electrically driven induced draft fans. All necessary pipes, flanges seals and valves, ladders, rails etc shall be included.

21.30.2 Maintenance water tank unit made of steel, of an appropriate volume, with level indicator and discharge pump with control panel and associated pipes, flanges valves etc shall be provided

21.30.3 All necessary interconnecting pipes, flanges, seals, valves etc to provide a functional system shall be supplied.

21.31 CHARGE AIR SYSTEM

The detailed specifications of the Charge Air system shall be provided by the design contractor. The Charge Air System shall include but is not limited to the following:

4.

21.31.1 Charge Air Filter shall be able to prevent/minimize the ingress of water droplets, and of an appropriate design to facilitate adequate air flow with high filtration efficiency.

21.31.2 The aspiration shall be turbocharged, Intercooler in air inlet system with remote mounted air intake, having multiple air filtrations, dry or suitable of latest design.

21.31.3 Ducting charge air system shall include adequately sized and necessary ducts, bellows, flanges, gaskets, bolts and nuts for a functional system.

21.32 OILY WATER SYSTEM

The detailed specifications of the Oily Water System shall be supplied by the design contractor. The system should be capable of operating in both automatic and manual from a control panel with all alarms. The Oily Water system shall consist of but not limited to the following:

5.

- 21.32.1 Oily Water Transfer Pump Unit of an appropriately sized pump with all necessary pipes, valves, gauges, filters and controls etc. to transfer oily water from the collecting sump to an oily water buffer tank.
- 21.32.2 Oily Water Buffer Tank of an appropriate capacity consisting of all necessary heaters, valves, level sensors and gauges etc.
- 21.32.3 Oily Water Feed Pump Unit to transfer oily water from the buffer tank to the Oily Water Treatment Unit
- 21.32.4 Oily Water Treatment Unit of an appropriate capacity inclusive of all necessary accessories to have a fully functional unit.
- 21.32.5 Sludge Tank of an appropriate capacity consisting of all necessary heaters, valves, level sensors and gauges etc.
- 21.32.6 Sludge Transfer Pump Unit of appropriate capacity including all necessary controls, valves, gauges etc for a fully functional system.
- 21.32.7 All necessary pipes, valves, flanges etc to make the Oily Water System fully functional.

21.33 WATER TREATMENT SYSTEM

The water treatment system shall be used to provide water of the appropriate properties and within specified parameters, based on the raw water quality, to the plant for use by the consumers (equipment and personnel).

The detailed specifications of which shall be supplied by the design contractor. Water Treatment system shall consist of but not limited to the following:

- 21.33.1 Water Treatment Unit of the appropriate capacity with the necessary filters, pumps, pipes, flanges, valves etc.
- 21.33.2 Treated water storage tank of the appropriate quality and capacity consisting of all necessary flanges, valves, level sensors and gauges etc.
- 21.33.3 Water Booster Unit capable of providing water within appropriate parameters allowing all consumers to have appropriate supply i.e. all necessary pumps and tank capacities, controls, pipes, valves, filters etc.
- 21.33.4 All necessary pipes, valves, flanges etc to make the Water Treatment System fully functional.

21.34 FIRE PROTECTION SYSTEM

This system shall consist of two sub-systems; Fire Detection and Fire Fighting. The fire protection system shall also be in accordance to local codes and the requirements of the Owner's Insurance Company. It is not the intent to specify all details of design and construction. The Design Contractor shall ensure that the equipment will be designed, fabricated, erected and tested in accordance with all building and fire codes, standards, recommendations and governmental regulations applicable to the specified services.

The fire protection system specified herein is intended to be operated by the power station operating staff. As such, it is required that the systems be designed and supplied so as

to be "user-friendly" to the extent that the Power Plant employees can reasonably be expected to operate them effectively under emergency conditions.

21.34.1 FIRE DETECTION SYSTEM

The detailed specifications of which shall be supplied by the design contractor. The Fire Detection system shall consist of but not limited to the following.

Fire alarm center located in an appropriate area where all alarms are indicated within specified categories and locations while the attached devices are supervised

Fire detectors and manual call points of the suitable amounts, types and locations.

Alarm devices shall be of the appropriate amounts, types (bells, flashing lights etc.) and locations.

The system shall be able to connect to other plant control systems.

All necessary connecting wires, straps, conduits etc to connect the components into a fully functional system.

21.34.2 FIRE FIGHTING SYSTEM

The following areas shall be covered under the fire fighting system: Generating sets enclosures, Exhaust system, Electrical installations and Fuel Systems including storage area (reservoir tank farm). The detailed specifications of which shall be supplied by the design contractor. The Fire Fighting system used to fight fires when they occur shall consist of but not limited to the following.

21.34.2.1 Fire water pumps preferably both electrical and diesel driven pumps (mainly due to the event of total power loss) of the appropriate capacity with associated accessories (control systems, pipes, valves, filters etc) housed in a single location including wet pipe sprinkler system etc.

21.34.2.2 Firewater reservoir tank should be designed to an appropriate volume.

21.34.2.3 Outdoor Hydrants located strategically around the compound and indoor standpipe systems of an appropriate amount.

21.34.2.4 Outdoor and indoor hose cabinets with hoses of an adequate amount and location.

21.34.2.5 Portable fire extinguishers (CO₂, foam and dry powder) of appropriate amounts and locations.

21.34.2.6 All necessary pipes, valves, flanges, support etc to make a fully functional fire fighting system.

21.35 AUTOMATION SYSTEM

The aim of the automation system shall be to supervise and control the operations of each generating set and auxiliaries and electrical systems from a central location in a safe, reliable, efficient and simplistic way. The system shall be capable of operating each generating set in the following control modes:

Isochronous load sharing mode (must be able to operate in this mode when connected to the grid)

- MW Mode
- Speed droop mode
- Constant Power Factor control mode
- Voltage droop compensation control mode
- Voltage droop mode

The system shall have two (2) operating modes; AUTO- where the operator inputs settings of active and reactive power from the Operator Interface System workstation and MANUAL- where these settings are controlled by switches in the control panel. The operating modes shall be automatically switched based on the parallel with grid information.

21.36 OPERATOR'S STATION

The operator's station shall consist of two identical workstations complete with CPU, mouse, keyboard and suitably sized displays for supervision and control while a third read only workstation shall be provided in the Plant Manager's office. In addition another workstation shall be provided to handle the plant's long term data storage and reporting functions. The operator's station shall have, but not limited to the following features:

- 21.36.1 Process status display using dynamic objects which provide function and operational status by interacting with it.
- 21.36.2 Up to six measured values (temperatures, pressures, speed etc) as desired by the operator shall be displayed on a single graph for trend and other analytical purposes as necessary. The measured values shall be stored for a suitable time interval and can be recalled as needed.
- 21.36.3 The latest alarm shall be displayed from all screens which are part of an active alarm list until the process parameter normalizes and the alarm is acknowledged while the historical alarm and event list can be queried for further evaluation events.
- 21.36.4 Any of the Human Machine Interface (HMI) Software displays, alarm lists and reports can be printed via the provided laser printer.
- 21.36.5 Daily engine and plant reports of plant analogue measurement values including daily max., min. and average values which are stored for a suitable period.
- 21.36.6 Long term engine and plant performance tracking.
- 21.36.7 Daily production reports of generated active, reactive energy and hourly fuel consumption and stored for an appropriate time.
- 21.36.8 Monthly production reports (on daily level) and Yearly production reports with similar contents as daily reports are generated and stored for appropriate times.
- 21.36.9 Production reports shall include min., max., average and total sum calculations for the period.
- 21.36.10 Electronic log book with search possibilities for recording of operations and maintenance activities.
- 21.36.11 Any report on the reporting PC (with backup hard drive), can be printed by the supplied reporting printer via the reporting interface software
- 21.36.12 Electrical power shall be provided to all workstations by an adequately sized uninterruptable power supply (UPS).

21.37 CONTROL PANELS

- 21.37.1 There shall be three main control panels which are the central common control panel, central generating set control panel and the local generating set control panel. Further specifications of which shall be provided by the design contractor.

The **Central Common Control Panel** shall include but not limited to the following:

- a. Plant common systems' PLC unit for control and supervision
- b. Double frequency meter (for synchronizing).
- c. Double voltage meter (for synchronizing).
- d. Synchronoscope (for synchronizing).

- e. Manual synchronization control interface unit [sync mode selector switch, sync breaker selector switch, voltage adjustment (Genset), frequency adjustment (Genset), sync breaker close control button, sync order button for auto sync].
- f. Auto synchronizer.
- g. Check sync. Relay.
- h. Safety relay for emergency circuit.
- i. Mimic diagram for the electric system.
- j. Emergency stop button.
- k. Safety relay reset button.

21.37.2 Further specifications of the **Central Generating Set Control Panel** shall be provided by the design contractor. The **Central Generating set Control Panel** shall include but not limited to the following:

- a. Panel mounted meters for current meters (1 per phase); voltage meter; power factor meter; active power meter, reactive power, frequency.
- b. PLC unit for control and supervision of the generator set.
- c. Generating set emergency stop push-button.
- d. Power monitor unit – measurement of phase currents with stored min., max., average values; main and phase voltages with stored min., max., average values; frequency; active, reactive and apparent power; active and reactive energy imported, exported and total; power factor; harmonic distortion; engine running hours.
- e. Generator protection relay – over and under voltage protections; over and under frequency protection; reverse power protection; over current and short circuit protection; stator earth fault protection; loss of excitation protection; negative sequence (unbalance) over current protection.
- f. Manual control interface unit – generator set control mode selector switch; active power control mode selector switch; reactive power control mode selector switch; engine power control switch; generator voltage control switch; sync select and start of sync control switch; engine start push button with engine running indication light; engine stop push button with engine running indication light; breaker close pushbutton with breaker closed indication light; breaker open pushbutton with breaker opened indication light; engine shutdown indication light with reset button; breaker trip indication light with reset pushbutton; indication lamp test pushbutton.
- g. Differential protection relay.

21.37.3 Further specifications of **Local Generating Set Control Panel** shall be provided by the design contractor. The **Local Generating Set Control Panel** shall include controls for power plant auxiliaries but not limited to the following:

- a. Automatic voltage regulator (AVR) for generator
- b. PLC unit
- c. Emergency stop push button

- d. Safety relay for emergency circuit

21.38 CABLES & ACCESSORIES

21.38.1 GENERAL

21.38.1.1 Scope: The Contractor shall design, supply, install, terminate and commission all the cables systems for the plant.

21.38.1.2 Voltage Drop: The maximum permissible voltage drop shall be such that in no case shall the drop exceed 2.5% under normal running condition and 10% under motor starting.

21.38.1.3 Materials: All materials used, including those that are not specifically described shall be the best of their respective type, and of adequate size and strength to ensure the mechanical and electrical soundness of the installation are within acceptable range, reference to the National Electrical Code, IEEE, IEC and BS where mentioned. Such details being in the form of the manufacturers' literature, sketches, etc must be submitted to the Project Manager during the course of execution of works.

21.38.1.4 Insulation

- a) The insulation material shall be extruded cross linked polyethylene of low dielectric loss, high dielectric strength, low thermal resistivity and long term stability. It shall be free from contamination by oil, chemical and moisture. The extrusion process shall ensure that the insulation is homogenous and 15 kV voltage class XLPE Copper conductor power cable and other necessary items for the completion of the cable system.
- b) The power cable and accessories shall be designed and constructed in accordance with the requirements of latest IEC Standard. High Voltage Cross linked Polyethylene Insulated cable" and the most up-to-date experience for a system of this voltage level and shall incorporate the latest improvements of design and manufacture for the type of cables and accessories required. Free from voids and impurities. The process shall be dry method. The average thickness of insulation measured at section shall not be less than the value specified in the standard.

21.38.1.5 Cables and accessories shall include but not limited to control and instrumentation cables for delivered equipment including necessary joints and fittings to result in a fully functional system.

21.38.1.6 The cables shall have copper conductor and shall be selected with due consideration to load requirements of each feeder and short circuit current capacity of the cable in order to prevent premature insulation failure. The conductor insulation shall be numbered or colour coded.

21.38.1.7 For motor circuit, the cables shall have a current carrying capacity of at least equal to 125% of the full load current rating of the motor after application of the appropriate derating factors.

21.38.1.8 Cable supports shall be provided for the cables and shall be at least one cable support bracket per vertical section for interconnection between adjacent sections.

21.38.2 RACEWAY

(a) Raceway shall be provided for all cables, and these shall be rigid conduit metal through type cable trays.

(b) Raceway shall include all fittings, junction boxes, flexible attachments, raceway support hardware, etc.

21.38.3 CABLE ERECTION

Cable runs shall be selected so as to be far as possible straight and accessible. Routes shall not unnecessarily pass through zones where fire hazard may occur. They are also to avoid locations where exposed to oil (splashes, spray or mist), condensed moisture or dripping water. Cables shall be distant or screened from sources of heat such as boilers, hot pipes, resistors etc. Routes shall be protected from avoidable risks of mechanical damage, or where this is not possible, suitable shields should be installed or other precautions approved by GPL Inc.

21.38.3.1 Cable Ladders, Racks and Trays

(a) Concrete lined cable trenches shall be provided within the power station. All such trenches shall be provided with covers to form a flush finish with the finished floor level. Cables shall be secured by non-corrodible cleats supporting steelwork, or on trays. Wooden cleats shall not be used. Cables shall not be clipped or cleated directly to masonry. All cable supporting steelwork racks cleats trays and fixings in trenches or elsewhere shall be supplied under this contract.

(b) Where the cables are to be installed on racks, these racks shall be of galvanised steel angles or aluminium and designed such that the spacing and type of supporting cleat ensure that no undue pressure is exerted on the sheath or armour of any cable. These racks shall be mounted/suspended or supported for no obvious tilting and a maximum depression of 1/200 of the distance between supporting points when used at full capacity.

- (c) Cables tray shall be of the first grade perforated galvanised steel with folded side members and supported on steel work or masonry is required. Segregation of the various services shall be achieved by use of separate trays for each voltage grade of cable used. The design of the cable tray system shall make due allowance for the future installation of at least 10 percent spare cables and also for the installation of cables supplied by others.
- (d) Single core cables shall be laid up in close trefoil 3-phase groups and erected in separate non-magnetic clamps to the approval of the Guyana Power & Light Inc.

Where cables are erected on outdoor steelwork supporters, sun shades of approved design and materials shall be included and erected as necessary to protect the cables.

21.38.3.2 Cable Galleries and Trenches

Cutting away, making good trenching will be a part of the "Contractor's" work.

21.38.3.3 Cable Penetration

Cable penetrations through fire barriers, walls or floor, which divide the building in defined fire sections, shall be sealed to maintain full integrity.

Penetrations through ceiling, damp proof courses or water proof floor shall be sealed using cable glands or special compounds which can survive actual ambient stresses and seal expectable water pressures.

Penetrations through walls and floors shall be sealed to prevent air draught and overheating through these opening. A tailored lid shall be placed to protect the filling from being pulled out by animals or by draught.

17.a.1. Underground installation

- (a) *Direct Burial Of Cables* - Direct burial shall be used for outdoor lighting distribution, service cables to secondary building and similar purposes only shielded cable type are to be used for direct burial racing.
- (b) *Underground/Sub-Floor Cables in Pipe Or Conduit* - Underground cable installed under a building shall be in a raceway. Wide conduit/ rigid plastics pipe shall be used to provide raceways needed for MV cable trenches or from underneath the switchgears to generators and transformers as also for power and control cables between electrical rooms and field located equipment. Metallic conduit shall be used for housing signal cables which might be sensitive to electromagnetic interference. Power feeders from generators to switchgear room shall be built using large size conduits or rigid

plastic pipes embedded on concrete or, which is most common, in sand under concreting. For high currents multi (single core) cable systems shall be applied. Routing shall be made for fewest possible (sweeping) bends, no more than three bends are allowed between pulling points. Cables emerging from ground shall be protected by enclosures or extended raceways from minimum cover distance according to the applicable NEC or IEC standards. The upper ends of the raceway are to be sealed and not let oil or litter into the raceway.

(c) *Cables to and Onboard Machines* – Cables to and onboard machines like genset, auxiliary units etc. shall be primarily installed in rigid steel conduits where the most reliable fixing can be done by welding. All corrosive conduit materials shall be painted to give the required level of protection according to international standards. Any cable platform level lower than 1.5 meters above floor or platform level (and less than 1 m aside) shall be protected by structures or rigid metallic conduit or other well fastened profile.

1.1.1. *Civil Systems* – Exposed installation shall utilize available power and signal cables routes for process equipment.

21.38.3.4 Cable Pulling and Installation

Cable along main routes shall be laid on category dedicated cable shelves and rack as far as possible – HV cable on separate racks, LV power cables on power cable racks and instrumentation and control cables apart in separate groups onto own racks. All cables shall be laid to avoid any hazardous areas (fire, explosion, heat etc.) and installations shall be made in a manner so as to allow for cables to be added for future needs.

21.38.3.5 Cable Clamping

All cables in vertical runs shall be supported to ensure that no strain due to the weight of the cable is taken by any terminating box. Each cable when erected shall have permanently attached to it at each end, non-corrodible metal markers showing the cable identification number, voltage, rating, size and make up.

21.38.3.6 Cable Termination

All installed cables are to be terminated in accordance with applicable international standard.

Cable entries into panel, assemblies and appliances shall always be made using separate cable glands or bushes for each single cable.

All single core cable systems passing through steel plates shall be made so there is no magnetic material between the cables.

Cables to field instruments are to be cabled with a loop. This shall also be done anywhere else where cables are terminated into equipment expected to be regularly disassembles for maintenance or repair.

21.38.3.7 Cable Marking

Each cable end shall have a cable identification marking. The marking shall identify the cable using the cable identification code supplied in cable list and documents supplied.

21.39 ELECTRICAL SYSTEMS

21.39.1 MAIN SWITCHGEAR (MV SWITCHGEAR)

Further specifications of which shall be provided by the design contractor. The Main Switchgear/ Busbar shall include but not limited to the following:

- a) The main switchgear shall be of three phase, metal enclosed and air insulated indoor type.
- b) Provided with withdrawable Vacuum Circuit Breakers type circuit breakers adhering to the relevant IEC standards.
- c) The switchgear shall be designed manufactured and tested according to the IEC standards.
- d) Operating and indicating devices shall be visible on the front panel of the cubicle.
- e) Circuit breakers shall be equipped with auxiliary contacts, charging motors, closing and shunt tripping coils.
- f) Suitably rated current and voltage transformers for the connected measuring and protection devices and have the relevant accuracy classes.

The Switchgear shall consist of the following cubicles with the relevant ratings to be provided by the design contractor.

- a) **Generator cubicles** – circuit breakers of appropriate ratings; current and voltage transformers for measurement and protection; earthing switch; cable transformer for earth fault; ammeter; miniature circuit breakers; breaker control switches; auxiliary relay.
- b) **3- Grounding Transformer System** – 17.5KV class, 60 HZ, ZN connections, appropriate current rating etc. It shall include a grounding transformer, fused load disconnecter cubicle (Fused load disconnecter and earthing switch), all necessary weather proof (XLPE) HV cables between earthing transformer cubicle and earthing transformer, weather proof (XLPE) cable between earthing transformer and ground.
- c) **7- Outgoing Feeder cubicles** – Circuit breakers of appropriate ratings; current and voltage transformers for measurement and protection; earthing switch; cable transformer for earth fault; ammeter; voltmeter and selector switch; miniature circuit breakers; breaker control switches; auxiliary relay; two stage over current protection relay; two stage earth fault protection relay.
- d) **2- Incoming Feeder cubicles** – Circuit breakers of appropriate ratings; current and voltage transformers for measurement and protection; earthing

- switch; cable transformer for earth fault; ammeter; voltmeter and selector switch; miniature circuit breakers; breaker control switches; auxiliary relay; two stage over current protection relay; two stage earth fault protection relay.
- e) **3- Station auxiliary transformer feeder cubicle-** Circuit breakers of appropriate ratings; current and voltage transformers for measurement and protection; earthing switch; cable transformer for earth fault; ammeter; voltmeter and selector switch; miniature circuit breakers; breaker control switches; auxiliary relay; two stage over current protection relay; two stage earth fault protection relay
 - f) **3- Measuring Cubicle-** Voltage transformers; lightning arresters (1 per Phase); Voltmeter and selector switch; under and over frequency protection relay, under and over voltage protection relay; neutral voltage relay; miniature circuit breaker; auxiliary relay.
 - g) 2- Bus riser cubicle with measurement.
 - h) **Generator cubicle cable set-** XPLE insulated water proof medium voltage cables between generator and generator cubicle.
 - i) **Cable terminations and fittings-** all necessary cable terminations, cable fittings and joints for the above mentioned cables.
 - j) 2- Spare cubicles.

21.39.2 STATION SERVICE SYSTEM (LV SYSTEM)

The station service system shall distribute low voltage electricity to electrical consumers of the plant. The internal electricity supply to the power plant shall be 480V, 3 ϕ 4W and 220/120V 3W 1 ϕ , 60 Hz where applicable. Further specifications of which shall be provided by the design contractor. The station service system shall include but not limited to the following:

- a) Complete station auxiliary transformer of the appropriate ratings to sustain all necessary plant equipment.
- b) Complete Black start unit of the appropriate rating considering future equipment installation and should include a diesel generating set, light fuel oil tank, radiator, exhaust gas ducting and silencer, interconnecting pipes, valves, and flanges, electric panel, steel frame, container, acoustic enclosure to attenuate noise level.
- c) Low voltage switchboard built to IEC specifications with a steel sheet enclosed, cubicle type switchboard that feeds motor control centers, motors and other apparatus of the power plant and consists of 2 incoming feeders with 1 main switch, voltmeter with selector switch, ammeter (1per phase), fused outgoing feeders for local control panels, motor starters direct online for supplied electrical motors, and external protection.
- d) Radiator panels of the required amount.
- e) Station auxiliary transformer medium voltage XPLE cables and appropriate terminations, joints and fittings between station transformer feeder cubicle and station auxiliary transformer.

- f) Station auxiliary transformer low voltage XPLE cables and appropriate terminations, joints and fittings between station transformer and low voltage switchboard.
- g) Low voltage cables, terminations, joints and fittings between low voltage switchboard and the various motor control centers and electrical consumers.
- h) All necessary cable ladders of the various sizes.

21.39.3 DC SYSTEM

The DC system shall provide DC power to devices and systems that need to have ensured power to maintain safe operation during shutdown of the plant in case of main power supply failure.

Further specifications of which shall be provided by the design contractor. The Station Service System shall include but not limited to the following:

Appropriately sized DC system to ensure adequate power supply for proper functioning of the power plant

21.39.4 PLANT ELECTRIFICATION AND EARTHING

Further specifications of which shall be provided by the design contractor. The **Plant Electrification and Earthing** shall include but not limited to the following:

- a) Safety earthing system (above ground).
- b) Lighting and building electrification:
 - Electrification (all buildings)- indoor and outdoor lighting and small outlets shall be connected to a distribution board which is connected to the LV switchgear; all lighting fixtures and small power outlets shall be of general type for industrial use; cables shall be laid in cable trays and conduits; cable trays shall be made of hot dip galvanized steel or aluminium; trays shall be of the ladder type without covers indoors and with covers outdoors; all wall sockets and cable channels shall be surface mounted; conduits shall be made of galvanized rigid steel, aluminium or PVC; conduits for under the ground floor are made of plastic pipes and seamed water-proof.
 - Emergency Lighting (all buildings)- shall be signal safety light; signal lights shall be above exit doors and along escape routes; safety lights shall be installed in every room where additional lighting is needed during emergencies; emergency lighting fixtures shall be provided with built in battery and charger where power supplied from the light distribution panel.
- c) Lightning Protection system design to decrease risk of damage due to lightning strikes and consists of roof circuits made of steel wires, interception rods and clamps then connected to the ground grid via copper wires; the stack shall be fitted with an interception rod at the top then connected to the grounding grid or rods; the tanks are directly grounded.

- d) CCTV system shall allow monitoring of the engine hall and other critical areas from the control room and the manager's office.

21.39.5 GROUNDING

- (a) The Contractor shall provide all grounding cable, grounding mat, equipment, and materials required for a complete installation of low impedance 'earth' bonding and equipotential grounding system for optimum internal safety and immunity against as well low- as high frequency interference and also any circuits extending outside the equipotential grounding system bonded area of the power plant. Where extended or advanced control technology is used the electrode bonding shall be secured and interference bonding improved using earth line conductors along cable routes where practical. This shall include, but not be limited to, all facilities for grounding of panel boards, control panels, transformers, switches, lighting poles, lighting standards, and all electrical equipment enclosures. Two point grounding for each equipment, panel board and steel structure shall be provided.
- (b) The mesh net earthing electrode shall be built to incorporate but not limited to the entire furnished area and surrounding the foundations of buildings, tanks and other equipment.
- (c) The meshed grid shall be of bare copper conductors buried at a minimum of 500 mm below grade onto or below level of the excavation made for equipment foundations so as to ensure soil drying will not increase the earth resistance of the earth electrodes. Each earthing connection is to be built as short and direct as possible.
- (d) Ground electrode for system grounding shall consist of only solid and a grid or loop of bare copper conductors buried a minimum of 500 mm below the grade onto or below bottom level of the excavation made for equipment foundations. Multiple rods shall be interconnected by bare or insulated copper conductors using thermite welding or approved connectors. Conductors used to interconnect rods shall be buried a minimum of 460 mm. The design package for ground grids and systems for power plant with equipment operating at above 15 kV shall be submitted to the GPL Supervising Engineer for review. Grounding grid shall be constructed of minimum 95 mm² stranded bare copper cable.
- (e) Ground grid shall be laid so that the completed earthing system shall be in accordance with IEEE 80 using the following parameters:
- i. A body weight of 50 kg.
 - ii. Duration of ground faults used in calculations for maximum allowable step and touch potential shall be the time (based on known operating

- conditions) it would take for the backup breaker to clear the fault with a minimum of 0.25 sec. and a maximum of 1.0 sec.
- iii. Ground fault current shall be the higher of the line to line to ground or the symmetrical line to ground fault current
 - iv. In calculations of the grid current, the current division factor must be assumed to be 1.0 unless calculations based on known actual site conditions are provided to justify a lower number.
 - v. For calculations of allowable step and touch potentials, the resistivity of the surface material (ρ_{s}) shall be assumed to be 3,000 ohm-meters for a minimum 75 mm thick pad of clean crushed rock, 10,000 ohmmeters for a minimum 50 mm layer of asphalt, and 200 ohm-meters for a minimum 75 mm layer of concrete. For all other surface materials, the lower of 100 ohm-meters or the actual measured top layer (minimum 0.3 m layer thickness) soil resistivity shall be used
 - vi. Calculations of mesh voltage and ground potential rise (See IEEE 80) shall be based on actual measured soil resistivity. If native material is replaced by fill, calculations shall incorporate the effect of the measured soil resistivity of the fill.
 - vii. Soil resistivity of backfill material used for ground grids and ground rods shall be the same as or less than that of the surrounding soil. h. Commissioning tests shall be performed to verify that resistance to remote earth of substation ground grids and/or ground electrodes used for system grounding meet design requirements.

Further specifications of which shall be provided by the design contractor. Cables and Accessories shall include but not limited to all Control and instrumentation cables for equipment including necessary joints and fittings to make a fully functional system.

21.39.6 REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

- a) American National Standards Institute (ANSI) ANSI C2 National Electrical Safety Code
- b) American Petroleum Institute (API) API RP 2003 Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents
- c) Institute of Electrical and Electronics Engineers (IEEE):
 - i. IEEE 80 Guide for Safety in Alternating-Current Substation Grounding

- ii. IEEE 81 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
 - iii. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - iv. IEEE 399 IEEE Recommended Practice for Power Systems Analysis (Brown Book)
 - v. IEEE 1100 Powering and Grounding Sensitive Electronic Equipment
- d) International Electrotechnical Commission (IEC)
- i. IEC 61662 Assessment of Risk of Damage Due to Lightning
 - ii. IEC 61024-1 Protection of Structures Against Lightning
 - iii. IEC 61024-1-1 Protection of Structures Against Lightning Part 1: General Principles Section 1: Guide A – Selection of Protection Levels for Lightning Protection Systems
- e) National Fire Protection Association (NFPA):
- i. NFPA 70 National Electrical Code NFPA 99 Health Care Facilities
 - ii. NFPA 780 Lightning Protection Code
 - iii. Underwriters Laboratories (UL)
 - iv. UL 96 Lightning Protection Components
 - v. UL 96A Installation Requirements for Lightning Protection Systems
 - vi. UL 467 Grounding and Bonding Equipment

21.40 INCINERATOR SYSTEM

The incinerator system shall be used to burn the sludge generated by the plant in a safe and economical way. Further specifications of which shall be provided by the design contractor. The **Incinerator System** shall include but is not limited to the following:

- a) All necessary control and safety systems.
- b) Appropriately sized furnace and associated exhaust system.
- c) All necessary pipes, valves, flanges, fittings, pumps and filters etc to make a fully functional system.

21.41 FIRE PROTECTION FACILITIES

21.41.1 GENERAL

The Contractor shall design, manufacture, deliver to the Site, install, test and commission the fire fighting and fire detection equipment to protect the power station in its entirety . In particular, the following shall be included:

- I. C02 Gas fire protection system for the packaged units (if applicable).

- II. Water hydrant system including motor & diesel engine driven pumps, jockey pumps etc. (fixed)
- III. Portable firefighting equipment CO₂ and dry chemical powder (DCP)
- IV. Foam based fire suppression equipment for fuel tanks (fixed)

21.41.2 DESIGN REQUIREMENTS

- a. The general design of the fire protection facilities shall take into account that the basic operating policy for the power station will have the minimum of personnel supervision for the Diesel Engine.
- b. Where automatic systems are provided, alternative manual initiation facilities shall also be provided.
- c. All fire protection installations shall comply with the requirements of the codes of practice of the National Fire Protection Association, Boston, Massachusetts, U.S.A., and also the local fire protection code, as appropriate for the respective systems, to the approval of GPL Inc. The codes and practice of the Japanese Fire Protection may also be considered.

21.41.3 CO₂ GAS FIRE PROTECTION SYSTEM

- a. An automatic Carbon Dioxide (CO₂) gas fire protection system shall be provided in all machinery enclosures of Diesel Engine generating units (if applicable) except in the unit local control package. The fire protection system shall comply with the requirements of National Fire Code No. 12 published by the National Fire Protection Association, Boston, Massachusetts, U.S.A. or equivalent.
- b. The equipment shall consist essentially of smoke detectors distributed strategically within the enclosures which, on sensing a dangerous condition at any location, will initiate audible and visual alarms, trip all running plant including ventilation equipment, and release CO₂ gas into the affected enclosure. Actuation of the fire protection system shall also trip Diesel Engine generating unit and immediately shut off the fuel supplies to the unit at a point external to the enclosures. There will be time lag of 60 – 90 seconds between the activation of alarm and discharge of CO₂ gas, so that the personnel working in the package could leave safely.
- c. Facilities for alternative manual actuation of the fire protection system shall also be provided such that, when the manual mode has been selected the protection sequence will not proceed beyond the alarm stage without manual action by an operator
- d. System of lock off to (but not exit from) the enclosure affected shall also be provided.
- e. The fire protection system shall be segregated into separate zones so that at least the protection for any one compartment can be selected to the

manual mode whilst, at the same time, retaining the automatic mode for the remaining enclosures.

- f. Lock-off boxes shall be provided at all entries to enclosures, with switches whereby an operator may inhibit automatic release of extinguishant. These boxes shall be provided with status indicators signifying 'Auto on' 'Auto-off' and 'Extinguishing Released' and a red lamp shall also be illuminated at the box in the event of extinguishing release. The status shall be indicated at the control panel of the control building also.
- g. Fire detection shall be by means of ultra violet flame detectors with a backup system utilising rate-of-rise temperature detectors. The use of smoke detectors shall be subject to specific approval by GPL Inc. as regards their type and location.
- h. Audible and visual fire alarms shall be provided in all machinery enclosures, the local control cabs and in the control room of the control building. Additional audible alarms shall also be provided external to the engine generator enclosures.
- i. Particular areas of high fire risk such as confined spaces where lubricating oil could possibly come into contact with high temperature, surfaces shall receive special consideration. Such areas shall be treated as separate fire protection zones with detection and CO₂ gas injection facilities operating independently of the system provided for the machinery enclosure concerned.
- j. The fire protection equipment shall be complete in all respects including pipe work, valves, hose, strobes, fire detectors, nozzles, control equipment, fully charged CO₂ gas cylinders and cylinder racks.

21.41.4 HYDRANT SYSTEM

Fire hydrant of water type shall be provided in the power station. The fire protection system shall comply with the requirements of National Fire Code No. 15.

21.41.5 HYDRANT

Hydrants shall be installed at required places around the engine house. Each hydrant stand shall be fitted with an isolating valve and approved type of instantaneous hose complying 30-m hose with combined jet/water-fog nozzle shall be provided in the cabinet adjacent to each hydrant.

21.41.6 PIPING

The fire fighting water mains shall consist of buried piping of appropriate diameter. The underground pipe work shall be provided with an approved protective coating unless the pipe is manufactured from an approved non-corrosive material

21.41.7 PORTABLE EQUIPMENT

Adequate portable firefighting equipment as per safety standards shall be provided:

- a. CO₂ extinguishers (20lbs)

- b. CO₂ extinguishers with trolley (mobile fire extinguisher 125 lbs and 150lbs)
- c. Dry chemical extinguishers

The portable equipment offered shall be of a type for which replacement cartridges and dry powder refills shall be readily available locally.

21.42 TOOLS

21.42.1 GENERAL

- a. The following tools and equipment shall be supplied under this Contract and the Bidder is required to give a full list with details in the Schedule of Tools and Appliances when submitting his Bid.
- b. Each set of tools and appliances shall be provided with conveniently sized, robust, lockable boxes suitably inscribed with the name of the Plant for which they are to be used.

The tools and appliances with the boxes shall be handed over to GPL Inc. at the time of issue of the Taking over Certificate.

- c. One set of special tools, gauges and equipment required for the normal maintenance of the whole of the Plant shall be provided by the Contractor.
- d. One set of special lifting and handling appliances required for the normal maintenance of the whole Plant and equipment shall be provided by the Contractor.
- e. Special tool list with unit price shall be submitted with Bid.

21.42.2 HOIST/EOT

The hoist shall be of chain- block type and the capacity shall be selected taking into consideration of weight of object. The hoist shall be provided with the monorail, supporting materials for rail and anchor bolts. The hoists shall be installed in the following area, but not be limited to, for the convenience of maintenance [EDG etc.].

21.43 TESTS AND INSPECTIONS

21.43.1 GENERAL

- a. The Contractor shall perform all tests and inspections necessary to ensure that the material and workmanship conform to the Contract and design drawings. Those tests and inspections shall demonstrate that the equipment will comply with the requirements of this Specification and meet the specified guarantees.
- b. GPL Inc. and the Engineer shall have a right to access the Contractor or sub-Contractor's works to determine or assess compliance with the provisions of this Specification or to witness the Contractor's inspections or tests.
- c. The contractor shall supply to GPL Inc. as soon as practicable which shall contain details of each test performed and shall be prepared as required by GPL Inc., records, results and calculation of all electrical tests shall be provided.

21.43.2 WORKSHOP TEST

- a) All plant shall be subjected to type, sample and routine tests at the manufacturer's factory in accordance with these clauses and conditions of the Contract.
- b) Type, sample and routine tests shall be to the relevant ISO and IEC Standards or other approved international standards for equipment where the test requirements are not specified in these clauses.
- c) The Contractor may offer type test results for identical equipment in lieu of the type tests specified, in which case GPL Inc. may waive the specified type tests. If type test results for identical equipment are offered in lieu of the specified type tests, the Contractor shall also provide evidence as to the similarity of the equipment tested and the Contract equipment.

The Contractor shall submit evidence to GPL Inc. & Engineer that the instruments used for the testing shall have been calibrated at an approved testing laboratory within a period of up to six months for a portable instrument and twelve months for a fixed instrument.

21.43.2.1 Engine Generating Sets

- I. The engine generating sets shall be assembled as a complete unit and run under simulated operating conditions at the manufacturer's works. The units shall be tested to ensure smooth running and satisfactory operation of the accessories. Necessary tests shall also be performed for EDG as per relevant standard.
- II. The Contractor shall state in his proposal the performance and reliability tests to be carried out in the works. The Contractor shall give GPL Inc. & Engineer notice of the tests at least four (4) weeks in advance. The tests to be carried out shall include, but not be limited to, the following:
 - a) Dynamic balancing together with over-speed tests
 - b) Bench testing of all accessories
 - c) No load operation of the assembled units to test the followings among others:
 - i. Vibration
 - ii. Lubrication system
 - iii. Fuel system
 - iv. Jacket temperature
 - v. Exhaust temperature
 - vi. Governor system
 - vii. Temperature control system
 - viii. Air system
 - ix. Over-speed trip
 - x. Water system

xi. Individual accessories

21.43.2.2 Generator

The generator shall be operated at no-load on the factory test floor with the following observations and respective data so reported and reference to IEC Standard shall be made:

- a) Measurement of resistance of armature and field windings.
- b) Mechanical inspection and balance.
- c) No-load field current at rated voltages and frequency.
- d) Voltage phase balance and phase sequence.
- e) Dielectric tests.
- f) Insulation resistance of field and armature.
- g) Standard no-load and short circuit tests.
- h) Characteristic "V" curve test and efficiency tests.
- i) Generator fixed losses.
- j) Generator variable losses (at loads available with driving motor).
- k) Measurement of vibration
- l) Temperature rise test

21.43.2.3 Exciter

Each exciter shall be operated at no-loads on the factory test floor with the following observations and respective data so reported and reference to IEC Standard should be made:

- a) Saturation run
- b) Mechanical balance
- c) Resistance
- d) Dielectric tests
- e) Insulation resistance of windings
- f) Exciter characteristics tests

21.43.2.4 Control And Protection System

The following tests for the control and protection system shall be performed at the workshop.

- a) General inspection
- b) Measurement of insulation resistance
- c) Dielectric withstands voltage test
- d) Performance test of relay Error test of meter
- e) Sequential operation test of Control & Protection System.

21.43.2.5 Other Materials and Equipment

All other materials and equipment shall be tested at the Manufacturer's workshops in accordance with latest IEC, ISO; other approved international Standard and/or the request of GPL Inc.

21.43.3 FACTORY TEST WITNESSING

21.43.3.1 The Employer/Engineer has the right to inspect materials and equipment, and witness factory tests of any plant and equipment included in this Contract.

21.43.3.2 The approval of the Engineer of the results of any such inspection or test shall not prejudice the right of the Employer to reject the plant/equipment if it fails to comply with the Specification when installed or to give complete satisfaction when in service.

21.43.3.3 Prices for tests shall include supply, erection and dismantling of all materials and provision of all test facilities. The Contractor shall also provide in the price for the attendance by the Engineer's and Employer's representatives to witness the tests, that is, three (3) engineers for each trip. The price shall include food, accommodation, daily allowance, round trip economy air fare between Guyana /Georgetown and/or the Engineer's Home office and any other countries where equipment are to be tested and any internal transportation within the country of the test.

21.43.3.4 Before any plant/equipment is packed or dispatched from the Main or the Sub-contractor's works, all tests called for shall have been successfully carried out in the presence of the Engineer and/or Employer's representatives.

21.43.3.5 At least 30 days' notice of the date, time and place of all tests shall be given to the Employer so that arrangements can be made to have the test witnessed.

21.43.3.6 Prior to the tests, the Contractor shall submit an outline of the procedures and tests in its plans to demonstrate fulfillment of the requirements specified in the subsequent sections of the detailed technical specifications. Type tests necessary for proving compliance with the Specification and not specifically mentioned in the Schedules shall be undertaken at no extra cost to the Employer.

21.43.3.7 Any costs incurred by the Employer and/or the Engineer in attending a repeat type test brought about as a result of a failure of the subject under test and postponement of the test program shall be to the account of the Contractor.

21.43.3.8 Each consignment of materials shall be inspected and tested in the presence of representatives of the Employer and the Engineer. For each inspection, the following are to be provided for each representative:

Economy class return air ticket (from Georgetown or the Engineer's home office to Places of Test and/or Inspection);

Visa expenses, airport taxes and other incidental travel expenses as required;

Hotel accommodation including full board, plus daily allowances of US\$100/day for incidental expenses, for a minimum of 5 days for each trip.

21.43.3.9 The cost of all routine or sample tests on materials and/or analyses shall be borne by the Contractor. The cost of additional tests and/or analyses required by the Engineer and effected elsewhere than at the works of the Contractor or a subcontractor or on the Site will be borne by the Employer should such tests prove satisfactory, but the Contractor will be called upon to pay all expenses incurred by the Employer and/or the Engineer in respect of any work or material found to be defective, of inferior quality, adulterated or otherwise unacceptable.

21.43.4 TESTS AT SITE

Responsibility for Test

- a) The Contractor shall conduct the tests at the Site in accordance with these clauses and the conditions of the Contract.
- b) The Contractor shall provide all equipment and personnel required to carry out the tests, including the provision, installation and removal of all test instruments, the connection and disconnection of plant items and obtaining of all records. GPL Inc. will provide electricity, fuel, lubricating oil and water required for the tests on completion without charge to the Contractor.
- c) The Contractor shall prepare and submit to GPL Inc. at least three months prior to the commencement of testing, schedules in approved format for each test together with a programs provided by all Contractors.
- d) The Contractor shall submit one copy of the results of each of the tests at the Site to the Project Manager within one week of the tests being carried out. Four copies of the certificates shall be provided to GPL Inc. within one month of the tests being carried out.

- e) GPL Inc. staff will observe and participate in the tests on completion.
- f) The Contractor shall submit evidence to GPL Inc. that the instruments used for the tests have been calibrated at an approved testing laboratory within a period of up to six months.

21.43.5 SCOPE OF TESTS

The tests to be carried out and passed before taking over of the works by GPL Inc. shall be deemed to comprise two main stages of testing as follows:

- a) Preliminary tests which are tests performed prior to rotation or energizing at normal voltage or admission of normal water or air pressure to the main or auxiliary plant under test.
- b) Tests on completion which are tests to progressively prove the correct operation of complete auxiliary systems and of the main plant items. These tests shall be carried out in accordance with the conditions of the Contract.

21.43.6 RELIABILITY TEST PERIOD

- a) The tests on completion shall include a reliability test period [Initial Commercial Operation "ICO"] for the generating unit and auxiliaries, which shall commence when the Contractor has notified GPL Inc. that the unit is ready for commercial operation. During this period, the unit and auxiliaries will be required to operate under the working conditions of the station, within their operating limits, either continuously or intermittently as required by the operation of the station, without failure or interruption of any kind for a period of one hundred sixty eight (168) hours. The unit will be operated by the station staff and the Contractor shall provide at its own expense a suitable representative during each operating shift to provide instructions and guidance to operate the unit. The Contractor may make minor adjustments to the units, provided that such adjustments do not in any way interfere with or prevent the commercial use of the units by GPL Inc. or result in reducing the output or efficiency.
- b) Should any failure or Interruption occur in the operation of the units due to faulty design, materials or workmanship under the Contract but not otherwise, sufficient to interrupt the commercial operation of the units, the reliability test period of one hundred sixty eight (168) hours shall recommence after the Contractor has remedied the cause of the defect.

21.43.7 TESTS ON COMPLETION

- a) The Contractor shall give to GPL Inc. in writing twenty one (21) day's notice of the date after which he will be ready to make the tests on completion. Unless otherwise agreed, the tests shall take place within ten (10) days after the said date, on such day or days as GPL Inc. shall in writing notify the Contractor.
- b) If GPL Inc. fail to appoint a time after having been asked to do so or to attend at any time or place duly appointed for making the said tests the

- Contractor shall be entitled to proceed in their absence, and the said tests shall be deemed to have been made in the presence of GPL Inc.'s representative.
- c) If, in the opinion of GPL Inc., the tests are being unduly delayed, GPL may by notice in writing call upon the Contractor to make such tests within ten (10) days from the receipt of the said notice and the Contractor shall make the said tests on such day within the said ten (10) days as the Contractor may fix and of which it shall give notice to GPL Inc.. If the Contractor fails to make such tests within the time aforesaid GPL Inc. may proceed to conduct the tests. All tests so made by GPL Inc. shall be at the risk and expense of the Contractor unless the Contractor shall establish that the tests were not being unduly delayed in which case tests so made shall be at the risk and expense of GPL Inc.
 - d) GPL Inc. except where otherwise specified, shall provide free of charge, such labor, materials, fuel, water, as may be requisite and as may be reasonably demanded to carry out such tests efficiently. However all the calibration devices, standard or sub-standard special test instruments, stores, apparatus etc., required to conduct all the tests would be provided, arranged and installed by the Contractor at his own cost and expenses. The Contractor will pay all expenses including the custom duties etc. on the import or export of all such instruments etc.
 - e) If any portion of the works fail to pass the tests, tests of the said portion shall, if required by GPL Inc. or by the Contractor, be repeated within a reasonable time upon the same terms and conditions save that all reasonable expenses to which GPL Inc. may be put by the repetition of the tests shall be deducted from the Contract price.

21.43.8 FIELD INSPECTIONS AND TESTS ON ENGINE GENERATING UNITS

The following field inspections and tests will be carried out in the sequence detailed below, and the successful performance and completion of all the tests taken together shall constitute GPL Inc.'s acceptance tests:

- a) Inspection and Checking of Units - After completion of erection and/or installation, and before put into operation, each unit and all its appurtenances (engines, generators, motors, pumps, heaters, fans, piping, valves and all other mechanical and electrical equipment and material) shall be thoroughly cleaned and then inspected under the supervision of the Engineer and in presence of GPL Inc.'s Engineer for correctness and completeness of installation and acceptability for placing in operation. The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.
- b) Start-up and Trial Operation - Following the satisfactory completion of the inspections and checking of Diesel Engine units, the same will be placed in trial operation during which all necessary adjustments, repairs etc. shall be

made as required, then the unit being shut down as required. When the equipment is operating properly its characteristics shall be recorded on the start-up report sheets. Start-up reports for all the equipment must be completed before the start of the initial commercial operation period.

The time consumed in start-up and trial operation shall be considered as a part of the erection and installation period.

The following test shall be carried out.

- i. Start-up mechanical running test, adjustment of engine air intake/fuel injection valves control and interlocking, etc. The measured data such as pressure, temperature, vibration, adjustable speed range etc. shall be observed and recorded
 - ii. Checking of cooling system and lube oil system.
 - iii. Checking of over-speed tripping devices, protection and interlocking system, start-up and shut-down sequence of auxiliary system.
 - iv. Noise, NO_x and vibration level measurement.
 - v. Manual and automatic synchronization.
 - vi. Generator Protection relay testing.
 - vii. Checking of base load and peak load capability.
 - viii. Load rejection and governor tests.
 - ix. Testing of start-up times.
- c) Initial Commercial Operation (ICO) - The Contractor shall be responsible for running on initial commercial operation period at the Site, including all auxiliaries and controls for the Plant. The Contractor shall operate the units at various loads as specified by GPL Inc. after synchronizing the system. The initial commercial operation shall start on the specified date and shall last for one hundred sixty eight (168) hours during which time the unit and auxiliaries will operate continuously, uninterrupted without adjustment or repair to the satisfaction of GPL Inc. at all loads up to and including the maximum loads. On the completion of continuous operation for one hundred sixty eight (168) hours on all automatic and supervisory controls, GPL Inc. will instruct cycling operation, shutdown and start-up during the next seven (7) days. After satisfactory completion of these operations, the unit shall be considered to have been put on initial commercial operation from the date of start of the initial commercial operation.
- d) Performance and Acceptance Tests - Soon after the initial commercial operation tests have been run, performance tests shall be run to determine whether the equipment complies with the guarantee provided that unit is made ready for performance test by the Contractor and certified by GPL

Inc. & Engineer. The tests shall be conducted in accordance with the latest ISO or ASME Performance Test Codes applicable for Engine Generating Sets (HFO fired) using previously approved correction curves and complying with the following special conditions unless otherwise specified. The chemical analysis and lower heating values of the fuels shall be determined from two laboratories to be chosen respectively, one by GPL Inc., the other by the Contractor. GPL Inc. shall provide without charge such labour, material, fuel and water as may be reasonably required to conduct the performance and acceptance tests. The gross station efficiencies under different load conditions established during a four (4) hours continuous test shall be calculated in a manner as approved by GPL Inc. Power measurements at the generator terminals and at the incoming circuit of unit motor control centre shall be made with totalizing meters. Generator power output shall be held as constant as possible during the performance test. The HFO Fired Generator Set shall run at 25%, 50%, 75% and 100% of base rating and peak load prior to placing the unit into commercial operation and to prove that sudden load rejections from loads up to maximum capability can be accommodated by the engine without the speed rise being sufficient to cause the over-speed trip to initiate. The output and heat rate tests will be carried out on the unit in the following manner:

- i. 1/2 hour at 1/4 load
- ii. 1/2 hour at 1/2 load
- iii. 1 hour at 3/4 load
- iv. 1 hour at 4/4 load

Full load at the generator terminal for the purpose of the test will be calculated from the guaranteed output according to the site ambient installation conditions. Correction factors for variations of test conditions from the specified design conditions shall be stated in the Bid.

- e) Test Reports - The Contractor shall submit to GPL Inc. within three (3) months after the signing of the Contract, the detailed procedure for the conductance of the performance and acceptance tests for approval. The procedure shall include the following for such test or group of tests:
- i. The time duration of each test at each load.
 - ii. The number of test runs at each load.
 - iii. The sequence of the tests to be conducted.
 - iv. A list of instruments that will be used for each test.

The list shall designate which instruments are:

- i. Special test instruments
- ii. Certified
- iii. To be calibrated before and after each test
- iv. Check instruments

v. Station supply instruments.

Schematic diagrams showing all test points and cross references to the instrument list shall also be included.

- i. All formulas, calculations, conversion factors, curves, correction curves, etc., to be used in the conductance of the tests and the calculations of the test results.
- ii. Sample test reports or data sheets and all specific result sheet forms that will be used for the test.
- iii. Written procedure and description of conducting the test.
- iv. All test data to be recorded by the Contractor and GPL Inc. & Engineer.

Necessary tests shall also be performed for GBC & EDG as per relevant standard.

21.43.9 FIELD INSPECTIONS AND TESTS ON SWITCHGEAR EQUIPMENT

The following site tests shall be performed by the Contractor.

- a) Protection, Control, Alarm, Measurement and Indication Equipment
 - i. Wiring - Insulation resistance test using an appropriate size Megger shall be carried out on all AC and DC protection, control, and alarm and indication circuit. The insulation of all circuits shall be checked before proceeding with other tests and it is also essential that all AC wiring is correctly connected relay contacts, auxiliary contacts, etc., being closed, as necessary, to verify this. Checks shall be made on cable glands, cable jointing, fuse or circuit breaker and small panel items, such as indicating lamps. Static equipment which may be damaged by the application of test voltage shall have the appropriate terminals short circuited. Inter relay, inter unit and cubicle wiring carried out at the Site shall be checked to the appropriate circuit and/or wiring diagram.
 - ii. Where, it is found necessary during pre commissioning work to effect site modifications to the secondary wiring, site copies of the appropriate schematic and wiring diagrams shall be suitably marked as agreed with GPL Inc. before the circuit is commissioned. Loop resistance measurements shall be made on all current transformer circuits. Separate values are required for current transformer circuits.
 - iii. Check - All digital relays shall be examined to ensure that they are in proper working condition and correctly adjusted, correctly labelled, and are in good order and properly fitting.
 - iv. Secondary Injection - Secondary injection shall be carried out on all AC instruments and relays, using voltage and current of sinusoidal waveform and rated power frequency.

- b) Current Transformer Magnetizing Tests - The magnetization characteristic of all current transformers shall be checked at the minimum of two points to identify the current transformers with reference to the manufacturer's estimated design curve, and to determine the suitability of the current transformer for its intended duty. It may be noted that it is not normally necessary to check the characteristic up to the knee-point for this purpose. Special measures may have to be taken to ensure that the core is fully de- magnetized before commencing the test.
- i. Primary Injection – Primary current injection tests shall be carried out by the Contractor. The primary injection methods employed for a particular installation shall therefore be agreed with GPL Inc. Tests shall be carried out as follows:
 - 1.01 Local primary injection to establish the ratio and polarity of current Transformers of similar ratio.
 - 2.01 Overall primary injection to prove correct inter-connections between current transformer groups and associated relays.
 - 3.01 Fault setting tests to establish, where practicable, the value of current necessary to produce operation of the relays. If not practicable, these tests are to be carried out by secondary injection applied at the wiring close to the current transformer.
- d) DC Operations - Tests shall be carried out to prove the correctness of all DC polarities, the operating levels of DC relays and the correct functioning of DC relay schemes, selection and control switching, indicating and alarms.
- e) On Load Tests - In view of the hazards inherent in these tests, they shall be carried out under the direct supervision of GPL Inc. & Engineer. An operation and stability test shall be carried out for on load commissioning of unit type protection. Test for restraint shall be carried out to prove the characteristics of protective systems with directional/differential characteristics. On load checks shall be made after the protection gear has been placed in service to ensure that all connections and test links have been replaced and test leads removed, as well as to confirm the integrity of the current transformer circuits. Where necessary voltage readings shall be taken at the terminals on each relay & meters to ensure that loop connections between the relays & meters are complete. Special attention shall be paid to broken delta voltages and residual current circuits where zero voltage or current respectively may not be proof of the completeness of the circuit.

The above tests shall be recorded on approved test sheets, two signed copies of which shall be forwarded to GPL Inc. immediately after a test or series of tests has been completed.

GPL Inc. & Engineer shall countersign the test sheets if found to be satisfactory and retain one copy. The Contractor shall provide to GPL Inc. six bound copies of all site test sheet as final records.

21.43.10 ACCEPTANCE AND INTERIM OPERATION

- a. After the performance tests, if the equipment supplied by the Contractor is found to meet the guarantees and any other specified requirement, and if all other work called for hereunder has been completed, GPL Inc.'s acceptance will be forthcoming. This acceptance shall, however, not relieve the Contractor of his responsibility for first inspection.
- b. Should the equipment furnished by the Contractor fail to operate as required, or in case of failure to meet any of its guarantees, GPL Inc. shall have the right to operate the equipment, using the Contractor's supervisory operating personnel, until such defects have been remedied and guarantees met with. In the event that defects necessitate to the rejection of the equipment or any part thereof, GPL Inc. shall have the right to operate the equipment until such time as new equipment is provided to replace the rejected equipment. Such operation shall not be deemed an acceptance of any equipment.

1.1.FIRST INSPECTION

- a. The first Inspections/Overhauling after the completion of recommended hours of operation shall be undertaken by the Contractor and the charges on this account Including all corrections, repairs and replacements made by him shall be entirely at his own cost.
- b. For the first inspection/ Overhauling the Contractor will provide the supervisors with special tools and GPL Inc. will provide labour, normal tools, crane with driver under the responsibility of the Contractor. Fuels, lubricants and wages for the local staff for crane will be paid by the Contractor.
- c. First inspection/ Overhauling will in any case be carried out before expiry of the guarantee period of twelve (12) months, according to a programme to be mutually agreed between the Contractor and GPL Inc. The scope of first inspection will include, but will not be limited to, the item listed. The cost of these inspections/ overhauling will be included on the cost of spares and services of warrantee period.

21.44 CIVIL WORKS

21.44.1 REQUIREMENTS

The General Conditions, Bid Drawings and Schedules shall be read in conjunction with this Specification. Matters described in one are not necessarily repeated in the others.

21.44.2 GENERAL REQUIREMENT

- a. The Bidder's proposal shall cover all requirements of the Bid Documents and any other items not specifically mentioned but which are deemed to be necessary for the satisfactory design, supply of materials, construction, and supervision of the civil works on the basis of a turnkey contract.
- b. The Contractor shall upon examining the design of the foundations and major structures, develop and prepare the detailed design and the construction drawings of all civil structures for the approval of GPL Inc. which shall meet the equipment and structures specification, to be supplied by the Contractor for the Project.
- c. GPL Inc. shall reserve the right to examine the Contractor's design and to instruct a change or modification by the Contractor.
- d. These modifications shall be carried out by the Contractor without additional cost as a result of any claims made by the Contractor on GPL Inc.
- e. Approval of the design by GPL Inc. shall not relieve the Contractor of liability for the construction works.
- f. The Bidder shall familiarize himself with the site levels, subsoil and other data necessary to enable him to estimate the bearing capacity and foundation requirements, for use in the preparation of his Bid.
- g. It is the Contractor's entire responsibility to search for filling material for land reclamation work and to make all arrangements necessary for the satisfactory completion of the land reclamation work within the Project. His Bid shall include for all local eventualities.
- h. The Bidder shall quote firm prices which shall remain valid through-out the Contract Period on all items in the Price Schedule unless other-wise stipulated.

21.44.3 SPECIFIC REQUIREMENTS

21.44.3.1 Topographic Surveys

The Contractor shall carry out surveys as are necessary for the proper design and execution of the Works. The results of such additional surveys together with the survey drawings shall be submitted to GPL Inc. for approval.

21.44.3.2 Site Investigation

The Contractor may conduct soil investigation if deemed necessary at his own cost before submission of the bid. However, after signing of contract the soil

investigation at the cost of the contractor is mandatory for detailed design of the civil work.

21.44.3.3 Site Laboratory

The Contractor shall make arrangement for all necessary tests to be carried out by personnel with relevant experience from an approved laboratory.

21.44.3.4 Records and Drawings

The Contractor shall keep at the Site accurate and up to-date records and drawings of the Works, and shall submit these records to GPL Inc. at the end of every week. Such record shall include the amount of labour, plant and materials employed upon the Site during that week.

21.44.3.5 Samples, Testing and Inspection

GPL Inc. may request at any time to test or inspect sample of material and workmanship proposed and the Contractor shall furnish these immediately. When GPL Inc. & Engineer has approved the samples, material, and workmanship not corresponding in quality and character with the samples approved shall be rejected. The costs of all sampling and testing to be conducted either on the Site or in an approved laboratory shall be borne by the Contractor.

21.44.3.6 Standards and Codes of Practice

- a. The Civil Works shall be designed and constructed in accordance with the Specifications, and the relevant British Standards, American Standard or Eurocode. If the contractor wishes to use any Standards or Code than specified then reference should be made to these standards. The Contractor shall submit together with its bid a schedule of standards and codes of practice to be followed in the design and construction of the Works. Copies of these codes and standards shall be made available to GPL Inc. & Engineer during the design and construction period. In the case of the Standards and Codes not published in English, the Contractor shall obtain English translations when required and send them to GPL Inc.
- b. The Contractor shall be responsible for the establishment of design parameters to satisfy the requirement of the project.

Basic design conditions shall be as follows: -

- a) For Seismic horizontal ground acceleration: 0.15g
- b) Design Storm : Based on frequency- intensity Duration curves prepared for 6h
- c) Wind velocity : 100 miles/hr
- d) Design load for road : H-15 (AASHTO)
- e) Standards and codes of practice: ASTM, ACI, and inter-national codes of practice and other Standards to be approved by GPL Inc.

21.44.4 PREPARATION OF DESIGN AND DRAWINGS

- a) The Contractor shall prepare all designs and detailed working drawings as deemed necessary for the execution and completion of the Works.
- b) The Contractor shall be responsible for ensuring that the design satisfies the requirements of all local and national authorities. Design calculations shall be in accordance with an approved method and should take into account the most critical combination of dead load, wind load, and seismic load. Design calculations and detailed drawings shall be submitted to GPL Inc. for approval. The Contractor may commence construction on the Site only after drawings are approved by GPL Inc. & Engineer.

22 SCHEDULES AND DRAWINGS

Schedules

Schedule-A1	Guarantees
Schedule-B1	Technical Data Sheet
Schedule-C1	Drawings to be furnished with Bid
Schedule-D1	Delivery Times
Schedule-E1	Tools and Appliances
Schedule-F1	Essential Spare Parts & consumables
Schedule-G1	Deviations from Specifications
Schedule-H1	Civil and Building Works
Schedule-I1	List of Subcontractors
Schedule-J1	Description of Training Program
Schedule-K1	Mobilisation and Demobilisation Schedule for Construction Equipment
Schedule-L1	Method of Transportation and Unloading

Drawings

Canefield & Columbia Site Locations layout

22.1 SCHEDULE (A1) - GUARANTEES

22.1.1 A-1: PLANT OUTPUT GUARANTEES

The guaranteed performance of the plant (with all units) at ISO 8528 condition and 0.80 generator power factor shall be as follows:

Base Load Heavy Fuel Oil (HFO)

Net Power Output, KW :-----

Net Heat rate, KJ/Kwh :-----

NO_x Level [at 15% O₂] :-----

Noise level (dB) :-----

Net Heat Rate (LHV of fuel) at load & 100% 75% 50% At Site
Condition, KJ/Kwh :-----

Total Auxiliary consumption :-----

Lube oil consumption g/kWh :-----

22.1.2A-2: NET POWER OUTPUT

Net power output shall mean the total plant power output measured at the low voltage side of the step-up transformer (i.e. summation of generators terminal output less the total auxiliary consumptions including Fuel Handling System and excitation power, cooling system and all other auxiliary systems and losses which are normally required in continuous operation).

22.1.3A-3: NET HEAT RATE

Net heat rate shall mean the heat equivalent of the fuel consumed by the total plant, time based upon the Lower Calorific Value, divided by the net power output as defined above.

22.1.4A-4: FUEL

In so far as these performance guarantees are affected, the fuel shall be in accordance with the analysis given in the Technical Specification with a factor of safety applied,

22.1.5A-5: TOLERANCE

A positive tolerance of 1% in case of Net Heat Rate and no tolerance on Net Power Output shall be allowed. The performance tests shall be carried out on the site in accordance with Vol. 2, Technical Specification to prove that the

above performance guarantees are available. Also other capability/ parameters shall be verified.

22.1.6A-6: PERFORMANCE CORRECTION CURVES

The following curves, which are necessary for correcting Power Output, Heat Rate and Inlet/Outlet Temperature from the test ambient condition to the guarantee reference condition, shall be furnished with the Bid.

- a. Variation in barometric pressure
- b. Variation in ambient temperature
- c. Variation of generator efficiency with Power Factor
- d. Variation in pressure loss from atmosphere to compressor inlet flange
- e. Variation in pressure loss from turbine exhaust flange to atmosphere
- f. Variation in Altitude and Relative Humidity
- g. Others if any

22.1.7A-7: DATE OF COMPLETION

The Initial Commercial Operation of the plant shall be completed within the period after effective Date of Contract. **365 days**

22.2 SCHEDULE- (B1) TECHNICAL DATA SHEET

22.2.1 B-1: ENGINE AND ACCESSORIES

B-1	Item Name	Unit	Bidder's Data
1.01	General		
	Manufacturer		
	Type		
	Model		
2.01	Net output at site condition		
	Base Load	kW	
	Capable of unit load change without structural damage	kW/min	
	Critical Speed above and below rated speed		
	Max. Vibration		
3.01	Power Rating at Generator Terminal		
	Power Rating		
	Ambient Temp. = 45° C	kW	
	Ambient Temp. = 35° C	kW	
	Ambient Temp. = 25° C	kW	
	Ambient Temp. = 20° C	kW	
	Max. vibration limit	mm/sec	
4.01	Speed		
	Rated speed, Engine	rpm	
	Rated speed, Generator	rpm	
5.01	Engine Performance		
	Overhaul Life on Base Load	hours	
	Expected Life of cylinder	hours	
	Expected life of reciprocating parts	hours	

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	Expected Life of Stationery Parts	hours				
	Number of hours of continuous operation allowed at peak output	hours				
	Number of hours of peak operation allowed per year	hours				
	Overhaul life on peak load	hours				
	Overhaul life on number of hours	hours				
	Overhaul life number of starts	no.				
	Starting time from cold	in min				
	Starting time from standby	in min				
	Electrical power required for standby	kWh				
	Indicated hp	hp or kW				
	Brake hp	hp or kW				
	Indicated thermal efficiency					
	Break thermal efficiency					
6.01	MECHANICAL EFFICIENCY					
	Heat Rate		100%	75%	50%	25%
	Ambient Temp. = 45° C	kJ/kWh				
	Ambient Temp. = 35° C	kJ/kWh				
	Ambient Temp. = 25° C	kJ/kWh				
	Ambient Temp. = 20° C	kJ/kWh				
	Out-put		100%	75%	50%	25%
	Ambient Temp. = 45° C	kW				
	Ambient Temp. = 35° C	kW				
	Ambient Temp. = 25° C	kW				
	Ambient Temp. = 20° C	kW				
7.01	Start up time from cold start to synchronous speed					
	Normal	minutes				

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	Emergency	minutes	
	Capable rated load change without structural damage	kW/min	
8.01	Full Load Heat Balance		
	Useful work		
	Cooling		
	Exhaust		
	Friction, Radiation, and others		
	Heat Input		
9.01	Starting Time		
	From Cold	hour	
	From Standby	hour	
10.01	Time Required From No Load To Maximum Load		
	Normal	minutes	
	Emergency	minutes	
	Starting reliability	%	
	Number of consecutive starts to prove reliability	No.	
11.01	Sound Attenuation		
	100 meters from unit	dB	
	50 meters from unit	dB	
	1 meter from unit	dB	
12.01	Engine Data		
	Number of cylinder	No	
	Piston materials		
	Piston ring materials		
	Cylinder with liner material		
	Max allowable gas temperature after combustion	°C	
	Break mean effective pressure	psi	

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	Cylinder bore	mm	
	Piston stroke	mm	
	Mean piston speed	mm/sec	
	Complete engine weight	ton	
	Heaviest piece during erection	ton	
	Heaviest piece after erection (disassembled)		
	Engine output (On shaft)	MW	
	Specific Fuel Consumption	Nm ³ /kW h	
13.01	Cooling System		
	Type and description		
	Design ambient temperature for water	°C	
14.01	Lubrication System		
	Type and description		
	Capacity of lube-oil storage tank	liter	
	Cap. Of maintenance tank	liter	
	Type of lube-oil purifier	liter/hou r	
	Capacity of lube-oil purifier		
	Type of filtration unit		
	Manufacturer		
	Type of lube-oil heater		
	Pure lube-oil pump manufacturer		
	Type		
	Motor rating	kW	
	Capacity	liter/hou r	
15.01	Starting System		
	Type of starter		
	Manufacturer		

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	Capacity		
	Type of compressor		
	Pressure To stop compressor	bar	
	Pressure To start compressor	bar	
	No. of air bottle	no	
	Air bottle capacity	liter	
	Pipe line pr. To the engine	bar	
16.01	Engine Intake Air Filters		
	Manufacturer		
	Type		
	Material		
	Type of Louvres		
17.01	Turbocharger		
	Inlet pr. of turbine	bar	
	Exhaust pr. of turbine	bar	
	Suction pr. of compressor	bar	
	Exhaust pr. of compressor	bar	
	Temp. of air after compressor	°C	
18.01	Engine governor or control & hardware		
	Manufacturer		
	Type		
19.01	Main CPU unit specification		
	Manufacturer		
	Software manufacturer		
20.01	Name of speed regulation		
	Name of fuel valve control		
	Maximum speed rise after full load rejection to be guaranteed by contractor		

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21.01	Housing		
	Material		
	Finish		
22.01	Turning Gear		
	Motor rating	hp	
	Main shaft speed on turning gear	rpm	
23.01	Fire protection system/ Fire fighting devices		
	Manufacturer		
	Fire water storage tank capacity	liter	
	No. of fire hydrants hose cabinets		
	Fire pump rating (motor driven)		
	Fire pump rating (diesel engine driven)		
	No. of portable extinguishers	CO ₂	
24.01	Oil-Fuel System		
a.	Transfer Pump –Heavy Oil		
	Manufacturer		
	Number	no.	
	Capacity	liter/hour	
	Motor rating	kW	
25.01	Maintenance Lifting Device		
	Manufacturer		
	Type		
	Model		
	Capacity	ton	
26.01	Control Room Air Conditioning		
	Manufacturer		
	Model		
	Type		

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	Rating	ton	
27.01	Exhaust heat recovery system		Not required
28.01	Auxiliary boiler (not required)		
	Manufacturer		
	Capacity		
	Fuel type and consumption rate		
	Others		

22.2.2B-2: EMERGENCY DIESEL GENERATOR

B-2	Emergency Diesel Generator Engine Performance Data at the ISO 8528 Site Condition .	
a.	Type of EDG set	
b.	Model Number	
c.	Manufacturer of EDG set, Country	
d.	Net output at Site condition, Base load, KW	
e.	Net Heat Rate at Site Condition, Base load, KJ/Kwh	
f.	Guaranteed rate of unit load change is Capable without structural damage, KW/min.	
g.	Noise at a distance of 100 meters (in each octave band, see Vol. 2)	
h.	Critical speed above and below rated speed	
i.	Engine speed, rpm	
j.	Generator, rpm	
k.	Generator, rated Voltage & pf	
l.	Engine Starting System	
m.	Max. starting time required from standstill to full speed, (min)	
n.	Max. vibration limit, mm/sec	
o.	Min. time required for applying full load to unit,	

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	i. From cold standby, min ii. From warm shutdown, min	
p.	Estimated hours at or below base rating of between : Minor inspection, hours Normal inspection, hours Major overhaul, hours	
q.	Estimated shutdown period, hour and Man-hours for : Minor inspection Normal inspection Normal inspection	
r.	Number, type and arrangement of cylinders	
s.	Number of strokes	
t.	Compressor pressure ratio	
u.	Starting system	
v.	Description of Speed governing system and fuel control system	
w.	Fuel Consumption	
x.	Description of cooling system	
y.	Auxiliary power consumption, KW	

22.2.3B-3: GENERATOR AND ANCILLARIES

B-3.1	GENERATOR	
a.	Manufacturer	
b.	Country	
c.	Type	
d.	KVA Rating	
e.	Power Factor (0.80 min)	
f.	Max. leading & lagging KVAR capability	
g.	Rated voltage between lines, KV	
h.	Connection of armature winding	

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i.	Rated Current, A	
j.	Rated frequency, Hz	
k.	Efficiency i. at pf 0.8, % ii. at pf 1.08, %	
l.	Stator overloading, %	
m.	Critical speed, rpm	
n.	Max. torque when the stator is short-circuited, Nm	
o.	Generator Characteristics i. Instantaneous Max. short-circuit current at nominal voltage, A_{peak} ii. Sub-transient reactance, X_d'' pu iii. Transient reactance, X_d' pu iv. Synchronous reactance, X_d pu v. Negative sequence reactance, pu vi. Zero sequence reactance, pu vii. Field time Constant, $T_d'0$ sec viii. Transient time Constant, T_d sec ix. Initial time Constant, T_d'' sec	_____ _____ _____ _____ _____ _____ _____ _____
p.	Moment of inertia GD^2 of rotor, $Kg\cdot m^2$	
q.	percent rise on voltage when full load is rejected and operating: i. at pf 0.8, % ii. at pf 1.08, %	
r.	Telephone influence factor i. Balanced ii. Residual	_____ _____
s.	Class of winding insulation i. Armature Winding ii. Field Winding	_____ _____
t.	Type of cooling [TEWAC]	_____ _____

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u.	Short circuit ratio, sat	_____
v.	Generator rated excitation requirements for operation at rated kVA	_____
	i. Excitation Voltage	_____
w.	ii. Excitation Current	_____
	Generator calculated losses at 100% Base rating	_____
	i. Total generator iron loss, kW	_____
	ii. Generator stator I ² R loss, kW	_____
	iii. Generator rotor I ² R loss, kW	_____
	iv. Generator stray load loss, kW	_____
	v. Generator wind-age loss, kW	_____
vi. Total generator loss, kW	_____	
x.	Generator Weights	_____
	i. Weight of rotor, kg	_____
	ii. Weight of complete stator, kg	_____

B-3.2	EXCITER (Shaft Mounted, Brushless)	_____
a.	Manufacturer	_____
b.	Country	_____
c.	Type	_____
d.	Rated Output, kW	_____
e.	Rated load field voltage at 0.80 pf/1.00 pf	_____
f.	Rated exciter current at 0.80 pf/1.00 pf	_____
g.	Exciter ceiling voltage, V	_____
h.	Maximum continuous exciter current, A	_____
i.	Excitation system voltage response ratio	_____

B-3.3	AUTOMATIC VOLTAGE REGULATOR	_____
a.	Manufacturer	_____
b.	Country	_____
c.	Type	_____

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d.	Description of AVR, Ref. No.	
----	------------------------------	--

B-3.4	GENERATOR PROTECTION	
a.	Generator differential relay	
b.	Generator ground over-current relay	
c.	Field/rotor ground detection system	
d.	Reverse power relay	
e.	Loss of field relay	
f.	Voltage restraint over-current relays	
g.	Negative phase sequence relay	
h.	Under/Over frequency relay	
i.	Synchro-check relay	
j.	Lockout relays	
k.	EDG protection relays	
l.	Auxiliary relays	
m.	Inter-connection protection [main & back-up] from plant to grid	
n.	Others: Specify	

22.2.4B-4: 15 KV CLASS SWITCHGEAR

B-4.1	GENERATOR SWITCHGEAR	
a.	Manufacturer	
b.	Country	
c.	Circuit Breaker	
	i. Catalog No.	
	ii. Type	
d.	Closing current at 125 volts DC, A	
e.	Time to close, m sec	

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f.	Tripping current at 125 volts DC, A	_____
g.	Time to trip, m sec	_____
B-4.2	RATING AND CAPABILITIES	_____
h.	Current Rating, A	_____
i.	Voltage rating, V	_____
j.	Nominal 3 phase interrupting capacity, MVA	_____
k.	Maximum symmetrical interrupting capacity, kA	_____
l.	3 second short time rating, kA	_____
m.	Closing and latching capability, kA	_____
n.	Operating Mechanism	
B-4.3	INSTRUMENTS AND DEVICES	MANUFACTURER TYPE
o.	Current Transformers i. Single Ratio ii. Multi Ratio	_____
p.	Potential transformers	_____
q.	Control and instrument switches	_____
r.	Indicating lights	_____
s.	Lightning arresters	
t.	Surge protection devices	
u.	Type of bus insulation	
v.	Type of bus supports	
w.	Type of insulation on connections	
x.	Size of completely assembled switchgear i. Length, mm ii. Width, mm iii. Height, mm	_____
y.	Total weight of switchgear, kg	_____
z.	Attached type test report, No	_____

22.2.5B-5: CABLING AND GROUNDING

B-5.1	CABLING – Data required for all cabling includes but is not limited to:	
a.	Manufacturer	_____
b.	Country	_____
c.	Type Designation	_____
d.	Applicable Standard	_____
e.	Insulation Material	_____
f.	Cross Section of Conductor, mm ²	_____
g.	Conductor Material	_____
h.	Type of Conductor (round, stranded, compacted)	_____
i.	Outer Sheath Material	_____
j.	Min. Permissible Bending Radius, mm	_____
k.	Delivery Length, m	_____
l.	Voltage Description, V	_____
m.	Max. Operating Voltage	_____
n.	Current Carrying Capacity at Temperatures	_____
o.	Current Carrying Capacity at Laying Conditions	_____
p.	1 sec. short circuit current after full load at 70°C condition temp, A	_____
q.	Max. Conductor Resistance at 20°C, DC, Ohm/KM	_____
r.	Max. Conductor Resistance at 20°C, AC, Ohm/KM	_____
s.	Others, Specify	_____
B-5.2	GROUNDING WIRE – Data required for all grounding wire includes but is not limited to:	
t.	Manufacturer	_____
u.	Country	_____
v.	Conductor Size, mm ²	_____
w.	Type of Conductor	_____

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x.	Short Circuit Current for 3 sec, A	_____
y.	Weight per meter, kg	_____
z.	Delivery Length, m	_____
aa.	Others, Specify	_____

22.2.6B-6: OVERHEAD CRANE

Not Applicable

22.2.7B-7: COMMUNICATION EQUIPMENT

Not Applicable

22.2.8B-8: FIRE PROTECTION EQUIPMENT

B-8.1	HYDRANT & PUMPS (Motor, Engine & Jockey) – Data required for all includes but is not limited to:	
a.	Number of Hydrants / pumps for yard	
b.	Number of Hydrants / pumps for power house	
c.	Hose size and length (D x L) mm x m	
B-8.1	PORTABLE FIRE EXTINGUISHER – Data required for all includes but is not limited to:	
	150 lbs. trolley mounted dry powder extinguisher	
d.	Manufacturer	
e.	Country	
f.	Type of Powder	
g.	Weight of Powder, kg	
	10 lbs. portable dry powder extinguisher	
h.	Manufacturer	
i.	Country	
j.	Type of Powder	

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k.	Weight of Powder, kg	
	5 Kg portable gas extinguisher	
l.	Manufacturer	
m.	Country	
n.	Type of Powder	
o.	Weight of gas, kg	
	Auto-Release CO ₂ Fire Extinguishing System	
p.	Manufacturer	
q.	Country	
r.	Type of Powder	
s.	System Description	
	Fire Detection Equipment	
t.	Manufacturer	
u.	Country	
v.	Type of Equipment	
w.	Weight of panel, kg	
x.	22.2.9 Transformer Water Deluge, Ref. No.	
y.	Others, Specify	

22.2.10 B-9: CIVIL WORK AND BUILDING WORKS

B-9.1	STANDARDS and CODES to be used in design and construction includes but is not limited to:	
	ACTIVITY	STANDARDS and CODES
a.	Filling Works	
b.	Foundation Works	

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c.	Piling	
d.	Steel Sheet Piling Wall	
e.	Concrete Works	
f.	Reinforcement Works	
g.	Structural Steel Works	
h.	Road	
i.	Brickwork	
j.	Painting	
k.	Lighting and Power Supply	
l.	Air Conditioning System	
m.	Plumbing	
n.	Others, Specify	
B-9.2	CONCRETE	
	Proposed Materials Standards	
a.	Cement	
b.	Aggregates	
c.	Concrete Admixture	
d.	Reinforcement	
e.	Others, Specify	
	Proposed Manufacturers / Sources / Quarries	
f.	Cement	
g.	Aggregates	
h.	Concrete Admixture	
i.	Reinforcement	
j.	Others, Specify	
	Compressive Strength at 28 Days	
k.	Engine generator foundation Kg/cm ²	
l.	Supper-structure Kg/cm ²	

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m.	Pile Kg/cm ²	
n.	Concrete pavement	
o.	Others, Specify	
B-9.3	PILING AND SUBSOIL IMPROVEMENT	
	Piling (Provide for each type of pile)	
a.	Type of foundation pile	
b.	Diameter/cross section and length (D x L) mm x m	
c.	Allowable working load of a pile, Kg	
d.	Method of driving in Piles	
e.	Piling Plant	
f.	Method of Jointing Piles	
g.	Name of structures, equipment and buildings to be applied	
	Subsoil Improvement (if any)	
h.	Method of subsoil improvement	
i.	Expected allowable bearing capacity of subsoil (After improvement) Kg/m ²	
j.	Name of structures, equipment and buildings to be applied	
B-9.3	STEEL SHEET PILING	
k.	Type of Sheet Pile	
l.	Length of a Pile, m	
m.	Width of a Pile, mm	
n.	Yield Point, Kg/cm	
o.	Ultimate Tensile strength, Kg/cm ²	
p.	Supplier	
	Specification of tie rods	
q.	Materials	
r.	Diameter, mm	

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s.	Length of a tie rod, m	
t.	Interval, m	
B-9.5	STRUCTURAL STEEL WORKS	
a.	Grades of Steel	
b.	Suppliers of Steel, Bolts & Fasteners	
c.	Methods of Welding	
	Corrosion Protection	
d.	Method and Materials	
e.	Place of preparation	
	Proposed Coatings	
f.	Type of Product	
g.	Manufacturer	
h.	Dry Film Thickness	
i.	Means of application	
j.	Place of application	
k.	Colour	
l.	Yield Point	
m.	Ultimate Tensile Strength	
B-9.6	GENERATORS & TRANSFORMERS	
	Weight (kg)	
a.	Engine	
b.	Generator	
c.	Emergency Diesel Generator	
d.	HFO Day Tank	
e.	Station Transformer	
f.	Others, Specify	
	Foundation Dimensions	L x W x H (meter)
g.	Engine-Generator	

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h.	Emergency Diesel Generator	
i.	LFO Storage Tank	
j.	HFO Day Tank	
k.	Station Transformer	
l.	Others, Specify	
m.	Weight of Engine-Generator foundation, Kg	
n.	Weight of Fuel tanks foundation, Kg	
B-9.7	MATERIALS & CONSTRUCTION EQUIPMENT	
	Walls and Roofing	
a.	Insulation Materials	
b.	Waterproofing Materials	
c.	Caulking Materials	
	Metal	
d.	Grades of Steel	
e.	Suppliers	
f.	Method and Materials for corrosion resistance	
	Construction Equipment and Specifications	
g.	Earth Works	
h.	Concrete Works	
i.	Pavement works	
j.	Structural Steel Works	
k.	Piling Works	
l.	Steel Sheet Piling Wall	
	Descriptions	
m.	Water Supply, Ref. No.	
n.	Civil and Building Works, Ref. Nos.	
o.	Air Conditioning System for the Buildings, Ref. No.	
p.		

22.2.11 B-10: ENVIRONMENTAL IMPACT
 B-10a Air Emissions Levels

Provide project air emissions:

Emission	Unit	100%	75%	50%	Percent Removal Efficiency at 100% Capacity
NO _x	ppmv				
	lb./hr				
	g/kj				
	mg/m ³				
CO ₂	ppmv				
	lb./hr				
	g/kj				
	mg/m ³				
CO	ppmv				
	lb/hr				
	g/kj				
	mg/m ³				
Air Toxics	list				
ppm is defined as volumetric parts per million at 15% O ₂					

B-10b Effluent Discharge

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P ₄	mg/e		Cr	mg/e	
BOD	mg/e		Cu	mg/e	
COD	mg/e		Fe	mg/e	
TSS	mg/e		Ni	mg/e	
PO ₄	mg/e		Zr	mg/e	
SO ₄	mg/e		Ac	mg/e	
NH ₃	mg/e		Cd	mg/e	
CL	mg/e		Pb	mg/e	
Detergents					
Oil & Grease					

B-10c Noise Level

Noise level at Facility Boundary dB (A)	Day	
	Night	
Noise level at 1 meter from equipment dB (A)		

22.3 SCHEDULE- (C1) DRAWINGS TO ACCOMPANY BID

Drawings which adequately indicate the general arrangement of the equipment principle of operation, sizes general appearance and materials of construction shall be submitted. These drawings shall include, but not be limited to, the following.

- a) Mechanical flow diagrams
- b) Heat rate curve
- c) Inlet temperature Power correction curves
- d) Inlet temperature heat rate correction curves
- e) Starting and loading curve
- f) Electrical one-line diagrams of main and auxiliaries
- g) Generator capability curve
- h) Generator "V" curves
- i) Zero Power factor saturation curve
- j) Major piping connection
- k) Engine, generator and auxiliaries foundations
- l) Fuel Oil System
- m) Heat Balance Diagram.
- n) Major Control & Protection System.
- o) Power output vs Ambient temperature
- p) Lube oil system
- q) Service / Compressed air system
- r) Fire protection system.
- s) Control building layout and section
- t) Cooling water supply system layout
- u) Exhaust heat recovery system
- v) No load saturation curve
- w) Synchronous impedance curve
- x) Generator unit equipment arrangement
- y) Layout plan of central control room
- z) Foundation, loading and support information
- aa) Dimensioned Outline drawing of major equipment offered
- bb) Detail drawings and descriptions providing a complete understanding of the equipment offered

- cc) Other drawings specified in the Specification.

22.4 SCHEDULE-D1 DELIVERY TIME

ACTIVITY	NTP to FOB Date (Months)	Shipping Duration (Months)	Erection Duration (Months)	Testing & Commissioning (Months)	Total Time From Effective Date to Plant Acceptance
Engine- Generator, Emergency Diesel Generator, Transformer, other major equipment					
Tanks					
Structures & Buildings					

Guarantee Time from Effective Date to Plant Acceptance is ----- Days

Signature:.....

22.5 SCHEDULE – E1 MAINTENANCE TOOLS & EQUIPMENT

22.5.1 TOOLS AND EQUIPMENT FOR MAINTENANCE

The Bidder shall list below all special tools and equipment for maintenance, which will be supplied and included in total Contract Price. Contractor shall not be permitted to use any equipment/ machinery/ tools, which are to be supplied against the Contract.

1)	Description	Quantity

Note: The Bidder shall attach additional sheets as required.

22.6 SCHEDULE F1 SPARES AND CONSUMABLES

22.6.1 SPARE PARTS'

Bidder shall provide proof of the ability to obtain extended warranty from the equipment manufacturer for four years following the completion of the two years warranty period. The Bidder shall submit offer in the blank columns for year basis item-wise essential spare parts as listed (but not limited to) below:

Cost of the Essential Spare Parts quoted by the Bidder will be evaluated.

Item	DESCRIPTION	Unit	Unit Price (CIF)	Total Amount
1.	Spares for engines	1 lot		
2.	Spares for Generator	1 lot		
3.	Spares for fuel system	1 lot		
4.	Spare for Cooling system	1 lot		
5.	Spares for firefighting system	1 lot		
6.	Spares for HV switchgears	1 lot		
7.	Spares for MV switchgears	1 lot		
8.	Spares for LV switchgears	1 lot		
9.	Spares for control and instrumentation system	1 lot		
10.	Spares for PLCs	1 lot		
11.	Spares for HMI systems	1 lot		
12.	Spares for HRSG	1 lot		
13.	Spares for EDG	1 lot		
14.	Other spares	1 lot		
15.	Consumables	1 lot		

Note: Detailed list of spare parts with price of each item in the above table shall be given by the bidder.

22.7 SCHEDULE-G1 DEVIATIONS FROM SPECIFICATIONS

The following is a list of deviations from the Bid Documents

Clause No.	Page No.	Description and Reference to Documents Submitted by Bidder

Note: The Bidder shall attach additional sheets as required

22.8 SCHEDULE-H1 CIVIL AND BUILDING WORKS

The Bidder shall be reminded that this is Turnkey Contract in which he is entirely responsible for every aspect. No additional costs will be considered for any item which the Bidder has overlooked, but which is essential for the proper completion of the project in every respect so that the works fulfill the purpose for which they are required.

If GPL or the Project Manager requires minor modifications, additions or omissions to the scope of the Civil Works during the period of construction or maintenance, adjustment to the Contract Price will be made on the basis of the rates entered in the following Schedule.

The rates entered shall include all costs and expenses involved in the proper construction of the work, including overheads, profits, supervision, accommodation, insurances, transport, duties, all risks, liabilities or obligations etc. but excluding design costs, which are covered by a separate item.

The rates will be used to evaluate Board's or Project Manager's minor modifications, omissions or additions to the works. Rates for items not included shall be based on those quoted or analogous thereto.

Item	Description	Unit	Rate, USD
1.	Foundation Piling Mobilisation and Demobilisation (Specify items) Form of pile type and capacity stated	m	
2.	Excavation Excavate to reduce level and remove and deposit where directed on Site – include for timbering, dewatering, etc. (measured net sizes as drawing) Excavate to form pit, base or trench as previously described. Additional excavation beyond net sizes for working space to fix and remove formwork and to backfill	m ³ m ³ m ³	
3.	Concrete Work Unreinforced (grade to be specified) <hr/> <hr/>	m ³ m ³	
4.	Reinforced Concrete (grade to be specified) <hr/> <hr/>	m ³ m ³	
5.	Reinforcement 16 mm diameter and upward mild steel bar or round reinforcement hooked, bent and fixed including and necessary tying wire	kg	

	12 mm diameter as previously described	kg	
	10 mm diameter and ditto as previously described	kg	
	Fabric reinforced weighing 4 Kg per square meter, including fixing	m ²	
	Extra over mild steel rates for high tensile reinforcement (all sizes)	kg	
6.	Formwork		
	To sides of foundations, bases, etc.	m ²	
	To sides and soffits of beam	m ²	
	To wall	m ²	
7.	Structural Steelwork (grades to be specified)	1000 x kg	

22.9 SCHEDULE-I1 LIST OF SUBCONTRACTORS

The following is a list of subcontractors the Bidder proposes to employ for supply of materials and equipment and for erection and civil works

No.	Description of part or Equipment (Make reference to Specifications)	Subcontractor's Full Name and Address

Note: The Bidder shall attach additional sheets as required

22.10 SCHEDULE-J1 DESCRIPTION OF TRAINING PROGRAM

Details of Training program including curriculum and Training aid to be used

22.11 SCHEDULE-K1 EQUIPMENT SCHEDULE

MOBILISATION & DEMOBILISATION SCHEDULE FOR CONSTRUCTION EQUIPMENT

The following is the specification, numbers, purpose of use and phasing for the mobilisation and demobilization of construction equipment to be used on the Contract.

22.12 SCHEDULE-L1 TRANSPORTATION AND UNLOADING

22.12.1 METHOD OF TRANSPORTATION AND UNLOADING

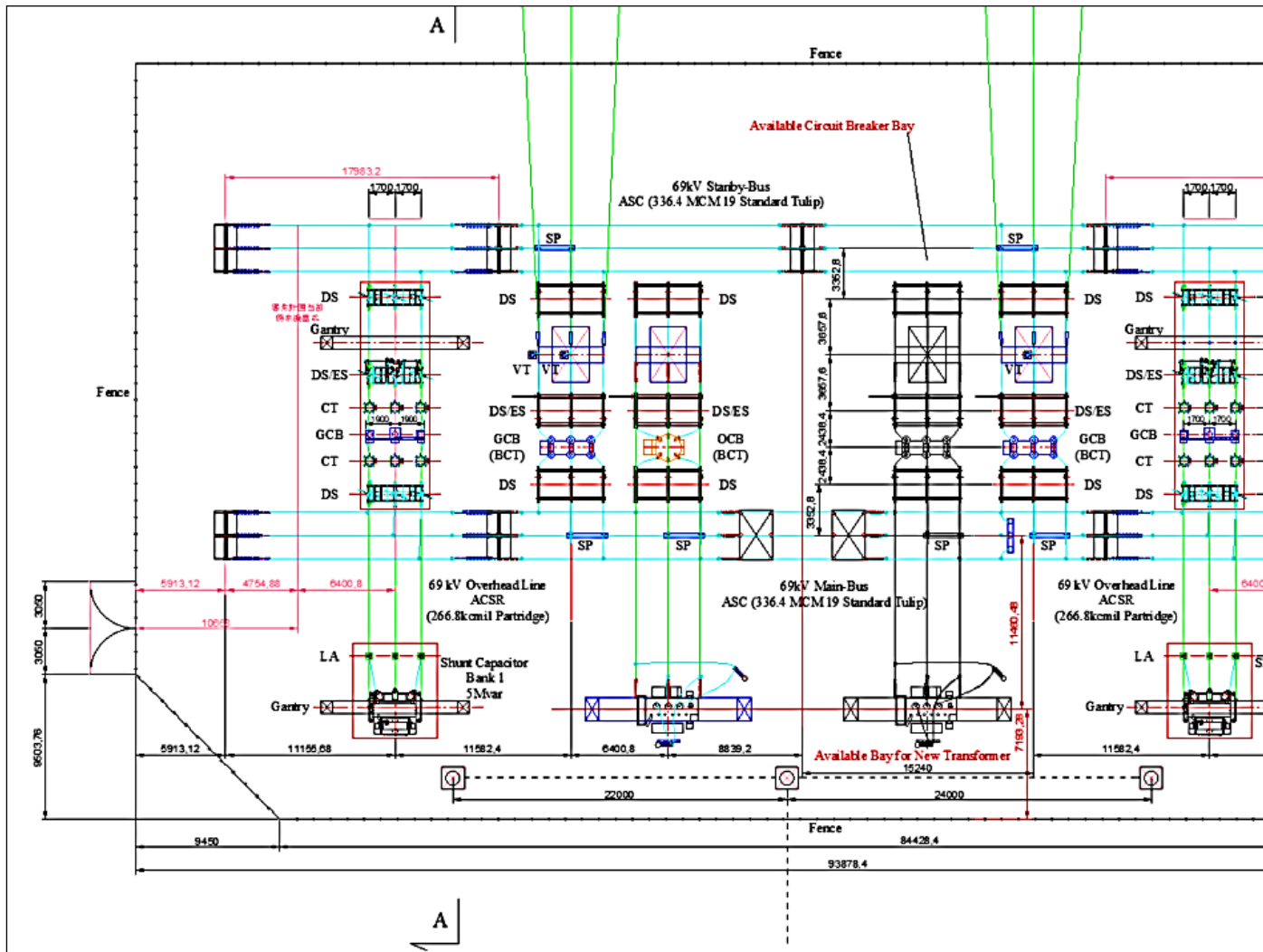
The following is a description of the Contractor's method for transportation to Site and unloading and installation at Site of the equipment for the Works.

Drawings

23 Canefield Substation Location



24 Canefield Substation Layout



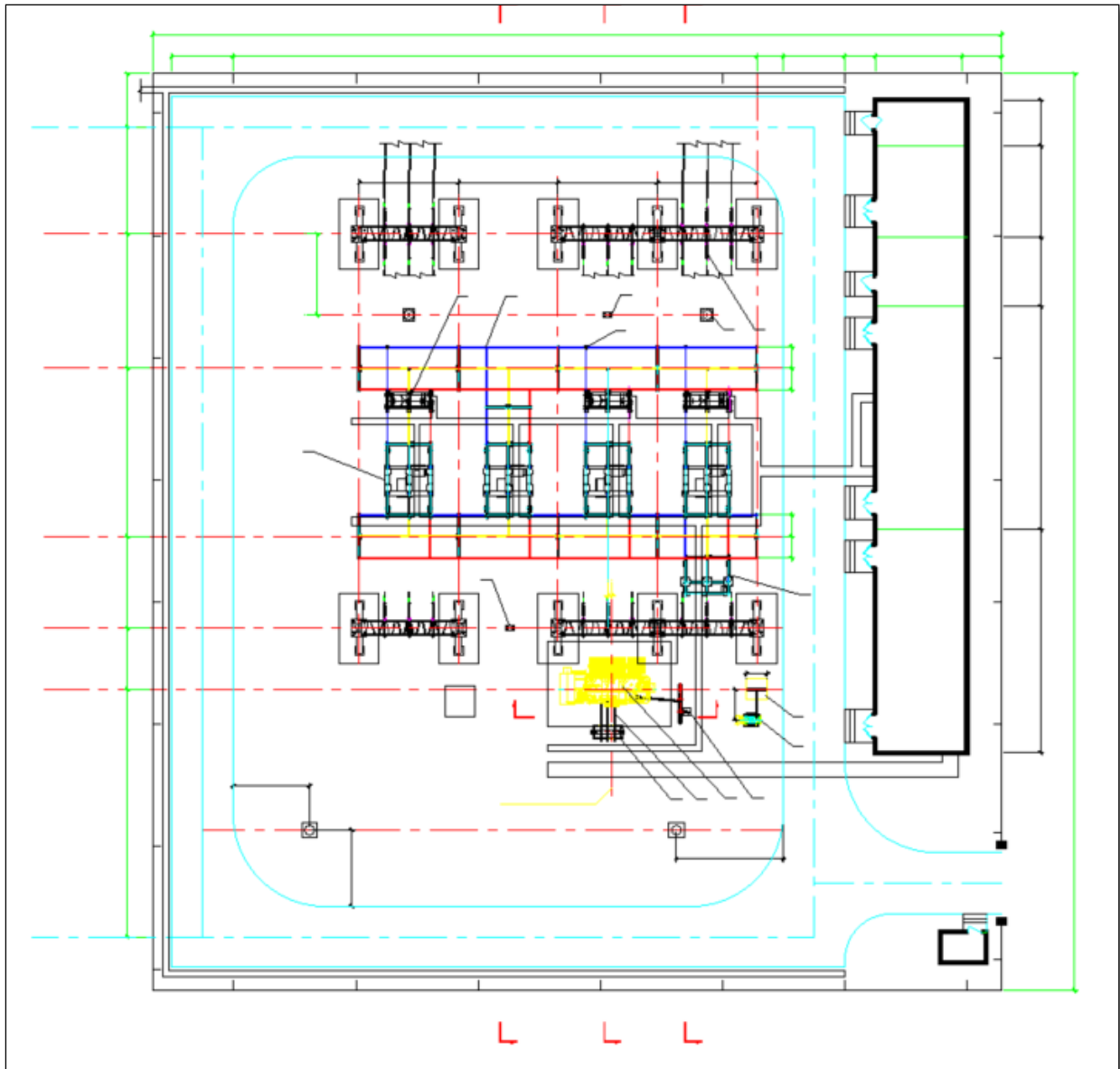
25 Available Land Space and River (Canje River), at Canefield to accommodate the Power Generating Facility



26 Columbia Substation Location (Alternative to New Sophia)



27 Columbia Substation Layout (Alternative to New Sophia)



28 Available Land Space at Columbia to accommodate the Power Generating Facility

29 APPENDIX 1

Technical Specifications for 60MVA 69/13.8kV Transformer

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1. SCOPE

This specification covers the design, manufacture, shop testing, pre-delivery inspection, packing at manufacturer’s works, transit insurance, delivery to GPL as per request of 60 MVA, ONAN rated, 69kV/13.8kV, copper wound, power transformers, complete with all accessories/fittings with first filling of new transformer oil in vacuum conditions and 10% extra transformer oil as specified herein and suitable for outdoor installation.

2. APPLICABLE STANDARDS

Except where modified by this specification, the transformer shall be designed, manufactured and tested in accordance with the latest edition(s) of the standards shown in Table 1. The Proponent may propose alternative standards, but shall demonstrate that the alternatives give a degree of quality and performance equivalent to or better than the referenced standards herein.

Acceptability of an alternative standard is at the discretion of the Purchaser in writing.

The Proponent shall furnish a copy of the alternative standard(s) along with the bid. If the alternative standard is not written in the English Language, a certified English Language translated version of the original standard shall be submitted with the bid.

Table 1: Applicable Standards

Item No.	ANSI/IEC/IEEE/ISO Standards	Title
1	IEEE C57.12.00	Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
2	ANSI/IEEE C57.106	Guide for Acceptance and Maintenance of Insulating Oil in Equipment
3	ANSI/IEEE C57.92	Guide for Loading Mineral-Oil-Immersed Power Transformers up to and Including 100 MVA with 55 Degrees C or 65 Degrees C Average Winding Rise

4	NEMA TR1	Transformers, Regulators and Reactors
5	IEC 60076	Power transformers
6	IEEE C57.12.90	Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers Corrigendum 1:Editorial and Technical Corrections
7	ANSI C57.12.20	Overhead-Type Distribution Transformers 500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800Y V and Below
8	IEEE Std 519	Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
9	IEC 600137	Insulated bushings for alternating voltages above 1 000 V
10	IEEE C57.12.70	Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers
11	IEEE C57.156	Guide for Tank Rupture Mitigation of Liquid-Immersed Power Transformers and Reactors
12	IEEE C57.12.31	Standard for Pole-Mounted Equipment-Enclosure Integrity
13	IEC 61099	Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes
14	IEC 60836	Specifications for unused silicone insulating liquids for electrotechnical purposes
15	IEC 62535	Insulating liquids - Test method for detection of potentially corrosive sulphur in used and unused insulating oil
16	IEEE C57.12.91	Standard Test Code for Dry-Type Distribution and Power Transformers
17	ISO 9001	Quality management systems - Requirements
18	ISO 9002	Quality management systems. Guidelines for the application of ISO 9001:2015
19	ISO 9000	Quality Management Systems - Fundamentals and Vocabulary

In case of conflict(s) with applicable standard(s), the order of precedence shall be:

- This Technical Specification for Power Transformer; then
- Other Applicable and Recognised Standards for Power Transformers.

3. INSTALLATION/SERVICE CONDITIONS

The installation conditions of the transformer shall be as follows:

CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION
PLANT GPL-PD-063-2022

- Maximum altitude above mean sea level < 1,000 m above sea-level
- Maximum ambient air temperature 40°C
- Maximum daily average ambient air temperature 35°C
- Minimum ambient temperature 15°C
- Maximum relative humidity 100%
- Wind Speed at typical transformer height 3 m/s
- Isokeranuic level 120
- Average Number of days with rain (mm) 206 days per year (> 0.1 mm)
- Average annual rainfall 188.4 mm

All outdoor materials, components and equipment shall be designed and protected for use in exposed, heavily polluted and salty, corrosive and humid tropical coastal atmospheric conditions.

Maximum temperature rise over ambient temperature:	
• In oil by thermometer	65 °C
• In winding by resistance measurement	65 °C
• Limit for hot spot temperature for which the transformer is designed	<80 °C
• Temperature gradient between windings and oil	20 °C
• Type and details of winding hot spot temperature detector	Resistance temperature detector
• Type of maximum winding temperature indicator	analog/ digital
Average Winding Temperature Rise	65 °C
Maximum Winding Temperature Rise	105 °C

4. ELECTRICAL SYSTEM CONDITIONS

The transformer shall be suitable for installation as a Generator Step-up Unit (GSU) or as a Substation Step-down Power transformer within GPL's Power System, which has the following characteristics (see Table 2).

Table 2: Characteristics of GPL's Power System

Nominal System Voltage, Frequency and Phase	High Voltage (HV) Side	69 kV, 60 Hz, 3φ-3-wire, Wye
	Medium Voltage (MV) Side	13.8 kV, 60 Hz, 3φ-3 wire, Delta
Voltage Class – High Voltage Side	75 kV	
Voltage Class – Medium Voltage Side	15 kV	
Short circuit withstand Capability	As per IEEE C57.12.00, section 7.1.4	
Insulation Level		
Basic Insulation Level (BIL)	110 kV for 13.8 kV side (Medium Voltage Level)	
	350 kV for 69 kV side (High Voltage Level)	
Power Frequency withstand level – Dry 1 Minute	36 kV for 13.8 kV side (Medium Voltage Level)	
	160 kV for 69 kV side (High Voltage Level)	
Power Frequency withstand level – Wet 10 Seconds	30 kV for 13.8 kV side (Medium Voltage Level)	
	140 kV for 69 kV side (High Voltage Level)	
Creepage Distance (minimum)	25 mm/kV for line-to-line and 44 mm/kV for line-to-ground for both 69 kV side (High Voltage Level) and 13.8 kV side (Medium Voltage Level).	
System Grounding		
Neutral Grounding	High Voltage Side	Wye - Solidly Grounded.
	Medium Voltage Side	13.8 kV busses are grounded via a zig-zag transformer with a resistor in neutral connection to earth.

5. AUXILIARY POWER SUPPLIES

The following power supplies shall be available at site:

- AC 3-phase, 480 volts, 60Hz, Earthed;
- AC 1-phase, 240/120 volts, 60Hz. Earthed; and

- 125 volts DC for essential alarms, indication and circuit breaker tripping.

6. TYPE OF TRANSFORMER

The transformer shall be double wound, sealed type, oil immersed with natural oil cooling (ONAN), three phase (3 ϕ) with ratings as specified herein. Additionally, the power transformer shall be completed with all accessories/fittings/ancillaries with first filling of new transformer oil in vacuum condition(s) and 10% extra transformer oil as specified herein and suitable for outdoor installation, all as per ANSI/IEEE C57.106.

The vector ground of the transformer shall confirm to YNd11 and is required to be equipped with four (4) HV and three (3) MV bushing terminations.

The design of the tank, fittings, bushings, etc., shall be of such that it will not be necessary to keep the transformer energised to prevent deterioration as the transformer may be held in reserve and outdoors conditions for many years.

7. RATINGS

The rating of the power transformer shall be 60 MVA, all units at ONAN rating.

The transformer, inclusive of tap changer and other load current carrying components, shall accept emergency overloading as per ANSI/IEEE C57.92, section 4.

8. TAPS AND VOLTAGE REGULATION

The transformer shall have the following voltage transformation ratio and tapping range:

- the nominal high-side voltage for the transformer shall be 69 kV and the medium-side voltage shall be 13.8 kV and conform to the vector group YNd11.
- tolerance on the voltage ratio shall be in accordance with IEEE C57.12.00, section 9.1;
- taps shall be provided in the high voltage winding (69 kV side), with steps of 1.25%, where there shall be four (4) steps above and eight (8) steps below the nominal primary voltage rating of 69 kV; and
- bidder shall state in the technical schedule, the percentage voltage regulation at full load, at power factor of 1.0 and at full load at power factor of 0.8 lagging. The primary and secondary voltage variation shall be based on a winding temperature rise of 65°C.

9. IMPEDANCE

The guaranteed value of impedance, measured at 65⁰C and on the nominal tap position and at the rated voltage of the transformer, shall be 13.3% to 14.22% for the 60 MVA transformer.

Tolerance for transformers' impedances shall be in accordance with IEEE C57.12.00, section 9.2, for impedance larger than 2.5%.

It should be noted that multiple similarly rated transformers should be capable of operating in parallel and having the above impedances.

10. SHORT CIRCUIT RATINGS

Bidders must submit all short circuit test results for compliance with IEEE C57.12.00, section 7.1.4.

11. LOSSES and CAPITALISATION OF LOSSES

The Bidder shall state the guaranteed losses. However, no positive tolerance is allowable on the guaranteed values. If the transformer for the mobile substation is supplied with losses exceeding the guaranteed values, the purchaser reserves the right to reject the transformer(s). The mobile transformer load losses (copper loss) shall not exceed 6% at 65⁰ C and no-load losses less than 10% (core loss).

The capitalization of guaranteed losses of the transformer shall be calculated and considered while evaluating the bids as the final bid price. The guaranteed values of no-load losses and load losses shall be stated in the bid, which should match the corresponding loss figures mentioned in the short circuit type test report submitted along with the offer by the bidder. Liquidated damages will be applied to successful bidder for not achieving the quoted guaranteed figures.

The Total Ownership Cost (TOC) formula is as follow:

$$\text{TOC} = \text{Bid Price} + [(A \times \text{NLL}) + (B \times \text{LL})]$$

Where:

1. **TOC** is the Total Owning Cost in US\$
2. **Bid Price** in US\$
3. **A** is the No Load-Loss Factor = 14.82 US\$/W

4. **B** is the Load-Loss Factor = 3.63 US\$/W
5. **NLL** is the No-Load Loss in W
6. **LL** is the Load Loss in W

12. FLUX DENSITY

The flux density at any point of the magnetic circuit, core, and winding, when the transformer is connected on the centre tap and operating at normal voltage and frequency, shall be stated in the bid and shall not exceed 1.5 Tesla (operating flux density). The transformer must be capable of operating at 20% overvoltage at 95% of rated frequency without resulting in magnetic saturation of the transformer's core or the flux density exceeding 1.5 Tesla.

The transformer shall be designed to have an operating overvoltage capability of 112.5% of rated voltage (continuous).

13. NOISE LEVEL

The acceptable audible sound levels for all transformers shall comply with NEMA TR1, Table 0-3. Bidders shall confirm procedure for noise level measurement according to IEC 60076-10 or IEEE C57.12.90 and submit audible sound levels test results with the bid document.

14. RADIO INFLUENCE VOLTAGE

Radio influence voltage of all transformers, contained herein, shall comply with NEMA TRI, section 0.03.1.

15. TAP CHANGING CHARACTERISTICS

The tap changer shall be designed to operate as an automatic on-load tap changer. The design shall also provide for manual override of the automatic on-load tap changer in the event of an emergency.

At minimum, the unit must display the mode of operation, the current tap position, indication of action (up or down) and time elapsed during change action. The unit shall

be IEC 61850 compliant to connect to SCADA system using protocol 101, must have clearly marked operation buttons and work with a power supply of 125VDC.

The OLTC shall have provisions to perform at least the following functions from local or remote control thru the substation SCADA system:

1. Selection to operate under automatic voltage regulator mode or manual mode.
2. Settings of the reference voltage for the automatic voltage regulator mode.
3. Setting of the dead band for automatic voltage control.
4. Manual operation to increase or lower the taps.

The tap changer position shall be provided locally and remotely thru the SCADA system.

Tap positions shall be numbered as shown in Table 3 unless an acceptable alternative number of taps is provided.

The operating handle shall have provision for padlocking and shall give a visual indication of the tap position without unlocking.

Each tap-changer position and the tap voltage or percentage associated with voltage shall be identifiable by reference to nameplate information. All positions of the tap changer shall be operative positions.

Tap changer handles shall be fitted with covers having gaskets, so that sealing of the transformer under normal conditions is independent of the switch shaft gland.

Table 3: Transformer onload tap positions.

Taps	HV Side Voltage (V)	Step %
1	72,450	5
2	71,590	3.75
3	70,725	2.5

4	69,865	1.25
5	69,000	0
6	68,140	-1.25
7	67,275	-2.5
8	66,415	-3.75
9	65,550	-5
10	64,690	-6.25
11	63,825	-7.5
12	62,965	-8.75
13	62,100	-10

16. CORE AND WINDINGS

The core and windings shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer shall be filled with preheated filtered degassed insulating fluid.

The core and winding shall be capable of withstanding mechanical shocks during transport, installation, and servicing, inclusive of thermal and mechanical stresses caused by any symmetrical and asymmetrical faults on any winding.

The transformer shall be provided with winding temperature indicator and combined alarm and trip relays of approved design, oil temperature indicator of approved design incorporating contacts and relay(s) for initiating alarms and trips, Buchholtz relay and low oil level alarm.

1. CORE

The core shall be manufactured from burr-free, grain-oriented silicon steel laminations and shall be precisely stacked to eliminate gaps in the corner joints.

Provision to the design and construction of the transformer shall be made to prevent movement of the core and windings, relative to the tank and any other ancillary

device(s) within the tank, during transport, installation and short-circuits (symmetrical and asymmetrical).

The design of the core shall avoid the presence of pockets, which can prevent complete emptying of the oil in the tank through its drain plug/pipe.

The transformer core assembly shall be boltless type.

2. WINDINGS

The winding conductor shall be of electrolytic copper, to give the optimum economic and technical results of the transformers over its operation lifespan.

The windings shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper, and shall be free from any other insulating compounds that are liable to soften, ooze out, shrink or collapse, and non-catalytic and chemically inert in the transformer oil during normal servicing. The windings shall be uniformly insulated, and the neutral point(s) shall be insulated for full line-to-line voltage on both sides of the transformer.

The stacks of windings shall receive adequate shrinkage treatment, and the windings and connections are to be braced to withstand mechanical shocks during transport, switching, short-circuit or other transient conditions.

The transformer shall be equipped with a buried delta winding.

17. SUPPRESSION OF HARMONICS

Each transformer's core shall be designed with attention to the suppression of harmonic voltages and currents, as per IEEE Std 519-2014 in Table 1 for bus voltage between 1 kV and 69 kV and Table 2 for current distortion limits for systems rated 120 V through 69 kV.

Proponents shall submit results for harmonic suppression tests for voltage and current distortions.

18. BUSHINGS AND TERMINATIONS

3. Bushings

Bushings shall be of the outdoor type and easily replaceable. Cemented types will not be acceptable. The bushings shall be sufficiently robust (mechanically) to withstand normal transport and erection hazards, as well as mechanical force developed for the short-circuit withstand capability current.

All bushings shall have a minimum creepage distance of 25 mm/kV for maximum phase-to-phase system voltage and shall have a continuous rating of 200 % of the transformer capacity rating.

Bushings should be such that they contain all necessary current transformers for measurement and protection. Polymer bushings can be used to leverage weight savings.

Bushings shall comply with IEC 600137 except where amended this specification. HV bushings shall be mounted on top of the tank, while the MV bushings shall be side wall mounted with full height air terminal. Both HV and MV bushings shall be provided with current transformers for overcurrent and differential protection, and measurement purposes of the transformer.

4. Bushing Labels

HV bushings shall be labelled H1, H2, H3, H0.

MV bushings shall be labelled X1 to X3 in accordance with IEEE C57.12.70 standards.

Marking letters shall be at least 80 mm (or 3 inches) high. The means of marking shall conform to the requirements of the section on Labels in this specification.

5. EARTHING TERMINALS

The transformer shall be provided with at least two earthing/grounding terminals comprising an isometric bolt and nut, which shall be non-ferrous material but not plastic. It shall include a spring washer and a lock washer.

External connecting strip(s) between earthing/grounding terminal and neutral bushing(s) is/are required.

19. TANK FABRICATION

6. GENERAL CONSTRUCTION FEATURES

All material used shall be of the highest quality and of the class most suitable for working under the conditions specified and withstand the variations of temperature and atmospheric conditions without distortion or deterioration or the setting up of undue stresses which may impair suitability of the various parts for the work which they have to perform. Similar parts, particularly removable ones, shall be interchangeable.

Pipes and pipe fittings, screws, studs, nuts, and bolts used for external connections shall be as per the relevant standards for power transformers. Steel bolts and nuts exposed to atmosphere shall be galvanized. Nuts, bolts, and pins used inside the transformers and tap changer compartments shall be provided with lock washer or locknuts. Exposed parts shall not have pockets where water can be collected settled.

Internal design of transformer shall ensure that air is not trapped in any location. Material in contact with oil shall be such as not to contribute to the formation of acid in oil. Surface in contact with oil shall not be galvanized or cadmium plated. Labels, indelibly marked, shall be provided for all identifiable accessories like Relays, switches current transformers etc. All label plates shall be of in corrodible material. All internal connections and fastenings shall be capable of operating under overloads and over-excitation, allowed as per specified stands without injury.

Transformer and accessories shall be designed to facilitate proper operation, inspection, maintenance, and repairs. No patching, plugging, shimming or other such means of overcoming defects, discrepancies or errors will be accepted.

Schematic Drawing of the wiring, including external cables shall be included on the inside door of the transformer marshalling box and placed in a secured and safe position from the elements.

The tank shall be of sealed construction and fabricated using materials to withstand a minimum of 15 psi internal pressures and to mitigate rupture as per IEEE C57.156 The Proponent shall state if other than bolted cover construction is used and shall give full

details of such construction. The interior of the tank shall be sealed to avoid moisture from getting inside the parts and loss of internal pressure.

The Proponent shall state the top oil temperature that corresponds to the tank's internal pressure of 15 psi and steady load at rated capacity and emergency loading condition while considering an ambient condition stated in this document. Adequate space shall be provided at the bottom of the tank for collection and draining of sediments.

Transformer tanks shall be designed to allow the unit to be lifted and transported with the total weight of the transformer, oil at the required level and any other attached ancillary, without any deformation or oil leakages. Lifting provisions shall consist lifting brackets welded to opposite sides of the tank and cover for separate lifting.

Additionally, for a total mass, equal to or greater than 2,000 kg, jacking pads shall be incorporated into the transformer tank design and construction, capable of withstanding the point load of the total mass of the transformer (tank, core, windings, and oil filled to the required level and all other attached ancillaries).

The tank shall be fabricated of construction steel with a minimum thickness of 11 mm; top and bottom covers of the tank shall have a minimum thickness of 11 mm, while the design shall ensure that skin effect is kept minimum.

Thickness below this value will be considered only in exceptional cases with a written guarantee and/or warranty from the Proponent and must be submitted along with the bid. The transformer tank and the top cover shall be designed to confirm with IEEE C57.12.31.

All sealing washers/gaskets shall be made of oil and heat resistant nitrile rubber or neoprene bonded cork seals suitable for temperatures as stipulated in this specification. Surfaces, where joints have gaskets, shall be of, such that, an even surface is presented to the gasket, thereby eliminating the necessity for the gasket to take up surface irregularities.

A conservator that prevents contact between the oil in the transformer tank and the ambient air shall be provided with the transformer, e.g., either the membrane type or multi-compartment type of split conservator.

The transformers shall be equipped with a Buchholz relay complete with alarm and trip contacts, an air relief valve, flanges, and valves to enable its removal without the need to drain the oil.

Facilities should be provided for measuring the top oil temperature by the installation of a tubular pocket at the top of the tank.

The diverter switch oil compartment shall be connected to a separate conservator or segregated section of the main conservator of the transformer

The finish of internal walls of tank, covers, connecting boxes and cooling systems shall effectively protect against the effects of corrosion and the influence of the oil or synthetic liquid used in the transformer.

All pipes, radiators, stiffeners, or corrugations, which are welded to the tank wall, shall be welded externally, and shall be double welded wherever possible. All welds shall be stress relieved.

7. Pressure Relief Device

Pressure relief devices shall be fitted to the liquid immersed transformer. Pressure relief devices shall be, and not limited to the following:

- provided with a trip contact;
- resetting, rapid acting, relief valve type that has a mechanical operation indicator; and
- provided with facility for directing emissions of liquid from the relief device in the direction specified.

Proponents shall submit all test results of the pressure relief device with the bid document.

8. Oil Level Indication

The oil level marker shall be externally visible to the transformer's tank and in compliance with applicable ANSI/IEEE or IEC standards.

9. Marshalling Box

A metal enclosed, weather, vermin and dust proof marshalling box fitted with required glands, locks, glass door, terminal Board, heater with switch, illumination lamp with switch etc. shall be provided with the transformer to accommodate temperature indicators, terminal blocks etc. It shall have degree of protection of IP 55 or superior.

20. FITTINGS

The following minimum standard fittings shall be provided:

- rating, diagrams and terminal marking plate;
- tank grounding terminal;
- lifting lugs;
- oil level indicator;
- manual pressure relief device; and
- drain/sampling valve with plug.

The fittings and accessories listed above are only indicative and any other fittings and accessories according to the applicable standards herein shall be equipped with the transformer.

21. TRANSFORMER OIL

The transformers shall be supplied filled with class 1 mineral oil conforming to ASTM D3487. The complete first filling shall be of new oil free from inhibitors and additives. The dielectric strength of the oil shall not be less than 72.5kV. If an antioxidant inhibitor is recommended, its use shall be subject to the Purchaser's approval. The transformer oil shall be non-corrosive on the basis of tests in accordance with IEC 62535.

22. PROTECTION DEVICES

10. Pressure Relief Device or Explosion Vent

The transformer tanks shall be fitted with a pressure relief device or explosion vent. It shall be built on the covers to protect against high pressures inside the oil tanks. It shall be provided with closed cover used as diaphragm which ruptures at a gauge pressure of 7.98 to 10.15 psi (0.55 to 0.7 bar) (preferably, the sealing of the explosion vent may be accomplished by a spring closed cover, having the same pressure gauge as before).

11. Buchholz Relays

The transformers shall be equipped with a Buchholz relay of earthquake proof design. These relays shall be mounted in the pipe connecting the conservator to the transformer tank.

The Buchholz relays shall be of the double float type with two sets of independent mercury contacts (one float actuated by a build-up of gas and the other by a sudden oil surge giving respectively signalization and tripping).

Adequate isolating valves shall permit the removal of the Buchholz relays, the conservator being still connected to the tank by a pipe shunting the relay.

The relays shall be provided with a window having a scale for reading the gas level. It shall be designed to allow taking a gas sample at any time from the device through a vent screw. The Buchholz relay design shall allow testing of the relay when the transformers are in service.

23. TEMPERATURE DETECTORS AND TEMPERATURE INDICATORS

The transformers shall be equipped with:

1. Resistance temperature detectors
2. Resistance temperature detectors of the Pt 100 type (100 ohms at 32°F (0°C)) shall be installed in an appropriate and approved manner in the following places:
3. Two (2) in the hottest spots of the core for remote temperature indication
4. Two (2) at the location of the hottest oil for remote temperature indication, provided the manufacturer would prefer to have this device combined with the temperature indicator as given in paragraph hereafter.

Temperature analogue output signals (i.e., 4 to 20 mA) shall be provide for remote indication in the plant control system.

For measuring the temperature of hot oil locally, each transformer will be provided with a dial thermometer complete with two electrical alarm contacts. The mercury bulb will be placed in an oil-filled pocket screwed into the transformer cover. The thermometer housing shall be of hose-proof, metal clad ventilated design. Contacts must be available for starting the pumps.

The indicating instrument shall be of stainless steel. The casing must be spring-suspended on the tank at eye-level. The dial will be scaled from -4°F to 302°F (-20°C to 150°C). A maximum pointer shall be provided which may be reset at any time by means of a push button.

Two or more additional pockets for the insertion of thermometers to check oil temperature shall be provided on the cover of the transformer.

Thermal image

The transformer shall be provided each with one thermal image. It will give the hottest spot temperature of the corresponding winding. The hottest spot temperature will be indicated on a dial thermometer placed on the tank (the scale of the dial thermometer will be at least up to 302°F (150°C)).

Contacts shall be available for alarm, tripping and for continuously starting the cooling pumps.

24. UNIT TRANSFORMER MONITORING SYSTEM

For permanent condition monitoring and early fault detection of each transformer, an online monitoring system shall be provided consisting of a dissolved gas-in-oil analysis-supervision (DGA) and collection of general operating data comprising at least the following measurements:

1. Foreign substances in the oil,
2. Temperatures, oil levels,
3. Voltage, current, power, losses on the transformer,
4. Operating condition of cooling and
5. Overload conditions.

The data shall be analysed, trends shall be displayed, and lifetime shall be estimated.

DGA analysis device shall provide information for estimated winding hot spot temperature, moisture level in paper, moisture bubbling temperature, insulation aging, overload capacity and cooling efficiency.

Following measurements shall be applied:

1. Gas Sensor: Fuel cell type sensor behind a gas permeable membrane in contact with mineral transformer insulating oil through a flooded manifold,

measurement range 0-2000 ppm (volume/volume, H₂ equivalent), sufficient measurement accuracy and sensitivity for H₂, CO, C₂H₂, C₂H₄ concentration,

2. Moisture Sensor: thin film capacitive type sensor immersed in mineral insulating oil through a flooded manifold, measured range 0-100% RH with sufficient accuracy

Each DGA shall have a display with Keypad, digital communications for local and remote system, gas and moisture level and trend data output, local alarm for gas and moisture, service in different configurations. Remote connection for monitoring thru the SCADA system shall be provided for each transformer.

Control and Terminal Cabinets, Wiring

This cabinet shall be accessible from ground level and be provided with a door for front access, handles locking facilities (key locks), heaters, internal lighting and electrical outlet on separate conduits.

All secondary wiring used on each transformer shall be carried out in suitably supported galvanized steel conduits or metal protective channels (bows and branches must be open) and brought to an adequately dimensioned terminal cabinet with sealed cover or equivalent design.

All cabling or wiring shall terminate in terminal blocks located in the cabinets described above. Two rows of terminal blocks shall be available arranged opposite each other, one for the external cables and one for the transformer cables. The wiring and terminal blocks shall be neatly grouped and arranged to permit connection with minimum number of external cables.

25. RATING AND CONNECTION PLATE

Each transformer shall be provided with anodized aluminium laser engraved nameplate, in accordance with IEEE C57.12 - Nameplate A and C as necessary.

The following plates, or an approved combined plate, shall be fixed to each transformer tank at an average height of 1500 mm above the ground level:

1. A rating plate bearing the data specified in IEC 60076 Part 1. This plate shall also include the short circuit current rating, measured no load current and no-

load losses at rated voltage and frequency, measured load losses at 75⁰ C (normal tap only) and D.C resistance of each winding at 75⁰ C.

2. A diagram plate showing in an approved manner, the internal connections, and the voltage vector relationship of the several windings, in accordance with IEC 60076 Part 1 with the transformer voltage ratio for each tap and, in addition, a plan view of the transformer giving the correct physical relationship of the terminals.
3. A plate showing the location and function of all valves and air release cocks or plugs. This plate shall also, if necessary, warn operators to refer to the Maintenance Instructions before applying vacuum.
4. Plates are to be of stainless steel or other approved material capable of withstanding the rigours of continuous outdoor service at site.

Additionally, Bidders shall ensure that the following attributes are indicated on the aforementioned nameplate and conform to the requirements of the section on Labels in this specification:

- standard to which it is manufactured and tested;
- identification of internal short-circuit and overload protection devices;
- type of cooling (ONAN);
- rated currents in A;
- chopped wave (short time) impulse voltage withstand level in kV;
- power frequency withstand voltage in kV;
- percentage impedance at 65⁰C;
- load loss in kW at rated current;
- no-load loss in kW at rated voltage and frequency;
- continuous ambient temperature at which ratings apply in ⁰C (40);
- top oil and winding temperature rise at rated load in ⁰C;
- winding connection diagram;
- total mass (core, windings, and oil) in kg;
- mass of core and windings in kg;
- volume of oil in litres;

- oil with less than 2ppm of PCB. The manufacturer shall test the oil to confirm that the oil contains less than 2ppm of PCBs and provide the test results to the Owner; and
- name of the purchaser (Property of Guyana Power & Light Inc.).

26. SURFACE TREATMENT

The transformer tank and all accessories shall be treated in accordance with IEEE C57.12. 29 to ensure enclosure and equipment integrity.

27. TESTS

All transformers shall be subjected to routine tests, as required in IEEE C57.12.00, as per section 8 and Table 18, including oil leakage tests, according to the relevant approved specifications at manufacturer's works. The transformers shall be subjected to pressure equal to the normal pressure plus 35 kN/m². This pressure shall be maintained for a period of not less than 48 hours during which no leakage whatsoever shall occur.

Tests shall also be conducted in accordance with the provisions of IEEE C57.12.91 and shall include, as a minimum, the following tests:

1. Ratio
2. Polarity
3. Phase Rotation
4. No-Load Loss
5. Excitation Current
6. Impedance Voltage
7. Load Loss
8. Applied Potential
9. Induced Potential
10. Impulse Test (typical data from previous unit is acceptable)
11. Temperature Test (typical data from previous unit is acceptable)
12. Sound Test (typical data from previous unit is acceptable)

The following routine measurements and tests shall be carried out and results shall be submitted to the Purchaser upon delivery:

- a. Measurement of winding resistance at the nominal and extreme tap positions for each transformer provided;
- b. Measurement of impedance;
- c. Measurement of no-load loss and no-load currents at full, 90% and 110% voltages;
- d. Induced overvoltage withstand test;
- e. Separate source voltage withstand tests on HV and MV windings;
- f. Magnetic balance test;
- g. Polarization Index Test. The index shall be not less than 1.5;
- h. Oil leakage test: The criterion of leakage shall be discolouration by oil of whitewash applied externally to suspected parts at an oil temperature of 90°C or other method approved by the Purchaser;
- i. Bushings and oil shall be subject to the following routine tests.
 - A. bushing routine tests
 - B. oil dielectric and moisture content test.

Routine test certificates shall include in addition to the test results, the Purchaser's order number, the transformers' serial numbers, outline drawing number and transformer kVA rating.

Upon acceptance of Tender, the Manufacturer/Proponent shall provide results of standard design type tests required in Table 18 of IEEE C57.12.00.

28. COMPLIANCE WITH SPECIFICATION

The transformer shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of tendering in the Non-Compliance Schedule in this document (see page 31).

29. COMPLIANCE WITH REGULATIONS

All the transformers/equipment shall comply in all respects with the Laws of Guyana Governing the Importation of Commercial Items and/or Goods.

The equipment and connections shall be designed and arranged to minimize the risk of fire and any damage that might be caused in the event of a fire.

30. QUALITY ASSURANCE, INSPECTION AND TESTING

12. General

To ensure that the supply and services are in accordance with the Specification herein, with the regulations of Guyana and with relevant authorized international standards, the Proponent shall have in place suitable Quality Assurance Programmes and Procedures to ensure that all activities are being controlled and documented, as necessary.

The quality assurance arrangements shall conform to the relevant requirements of ISO 9001 or ISO 9002, as deemed appropriate by the Purchaser and the Proponent.

The systems and procedures that the Proponent will use to ensure that the supply complies with the specified requirements, shall be defined in the Proponent's Quality Plan.

The Proponent shall operate systems that implement the following:

Hold Point "A stage in the material procurement or workmanship process beyond which work shall not proceed without the documented approval of designated individuals or organisations."

The Purchaser's written approval is required to authorise work to progress beyond the Hold Points indicated in approved Quality Plans.

Notification Point "A stage in material procurement or workmanship process for which advance notice of the activity is required to facilitate witness."

If the Purchaser's representative does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice, then work may proceed.

13. Quality Assurance System

Unless the Proponent's Quality Assurance System has been audited and approved by the Purchaser, a Quality Assurance System shall be submitted to the Purchaser for

approval within a minimum of One (1) month from the placement of order, or such other period as shall be agreed with the Purchaser. The Quality Assurance System shall provide a description of the Quality Control System for the supply and shall, unless advised otherwise, shall include, but not limited to the following details:

1. The structure of the organisation;
2. The duties and responsibilities assigned to staff to ensure quality of work;
3. The system for purchasing, taking delivery and verification of the specifications of raw materials;
4. The system for ensuring the quality of workmanship
5. The system for control of documentation;
6. The system for the retention of records; and
7. The arrangement for the Proponent's internal auditing.

14. Quality Plans

The Quality Plans shall set out the activities in a logical sequence and, unless advised otherwise, shall include, but limited to the following:

1. An outline of the proposed programme sequence;
2. The duties and responsibilities assigned to staff ensuring the quality of work;
3. Hold and notification points;
4. Submission of engineering documents required by the specification;
5. The inspection of materials and components on receipt;
6. Reference to the Supplier's procedures appropriate to each activity;
7. Inspection during fabrication and assembly; and
8. Final inspection and test.

15. Inspection and Testing

The Purchaser shall have free entry at all times, while work on the order is being performed, to all parts of the manufacturer's working area which are in relation to the processing of the transformers ordered. The Manufacturer/Proponent shall afford the Purchaser without charge, all reasonable facilities to assure that the transformers being furnished are in accordance with the specifications herein.

The equipment shall have successfully passed all tests as described in Section 24 (see page 182).

The Purchaser reserves the right to reject an item of the transformer if the test results do not comply with the values specified herein.

Tests, including any retests required, shall be carried out by the Supplier at no extra charge, at the manufacturer's works.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Purchaser by the Supplier for approval, at least one month before testing.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Manufacturer/Proponent.

Any cost incurred by the Purchaser in connection with inspection and re-testing as a result of the failure of the transformer or any of its components under test or damage during transport or offloading shall be to the account of the Proponent.

The Proponent shall submit to the Purchaser three signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the test certificates have been received by the Purchaser and the Proponent has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and **not** merely confirm that the requirements have been met.

No inspection or lack of inspection or approval by the Purchaser's Representative of equipment or materials whether supplied by the Proponent or a Sub-Proponent, shall relieve the Proponent from his/her liability to complete the contracted works in accordance with the contract would exonerate him/her from any of his/her guarantees.

16. Guarantee

The Proponent shall guarantee the following:

- Quality and strength of materials used;
- Satisfactory operation during the guarantee period of one (1) year from the date of commissioning, or 18 months from the date of acceptance of the equipment

by the Purchaser following delivery, whichever is the earlier. The Purchaser shall advise the Proponent of the date of commissioning;

- Performance figures as supplied by the Proponent in the Technical Data Schedule, the guaranteed copper and iron losses and other particulars;
- The offered surface treatment shall protect the treated metal from corrosion for a period of not less than ten (10) years from the date of delivery.

31. SPARE PARTS AND SPECIAL TOOLS

The Proponent shall provide a list of recommended spare parts and their individual prices and shall include HV and MV bushings. This list shall identify all essential spares and consumable items for any recommended maintenance for a period of five (5) years after commissioning.

The Purchaser may order all or any of the spares parts listed at the time of placement of order.

A spare parts catalogue with price list shall be provided and this shall form part of the drawings and literature to be supplied with the bid.

The Proponent shall give an assurance that spare parts and consumables will continue to be available through the life span of the equipment/transformers, which shall be 25 years minimum. However, the Proponent shall give a minimum of 12 months' notice to the Purchaser, in the event that the Proponent or any Sub-supplier, plan to discontinue manufacturing of any component used in the transformers.

Any spare apparatus, parts or tools shall be subjected to the same specification herein, tests and conditions as similar main material supplied. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the mobile substation and must be suitably marked and numbered for identification.

Spare parts shall be delivered suitably packaged and treated for long periods in storage. Each package shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts lists in the operation and maintenance instructions.

32. PACKING, SHIPPING AND DELIVERY

17. Delivery

The Supplier shall ensure safe transit from the Manufacturer's works to designated Warehouse and shall be responsible for all associated costs and expenses, including off-loading, delivery, and insurance.

Customs Clearance and Delivery from such Designated Warehouse to Site shall be carried out by GPL at their expense.

18. Delivery Documentation

Delivery Documentation shall include the following, at a minimum:

- a clearly defined delivery docket number
- supplier's name;
- contract number / order no.
- quantity of material, description, and GPL Item No.
- packing list

A packing list in a sealed waterproof envelope shall accompany each case/drum or other delivery configuration.

Two copies of each packing list shall be sent to the Purchaser prior to dispatching the equipment/material.

19. Marking of Items

Each item/package shall be indelibly marked, on two sides - with the following:

- individual serial number;
- purchaser's name;
- contract number / order no.
- supplier's name;
- manufacturer's name;
- country of origin;
- description of contents; or

- conductor/cable details and length on drum
- case/drum measurements;
- gross and net weights; and
- all necessary slinging and stacking instructions.

20. Delivery Schedule

Bidders shall state and guarantee a delivery time from the date of receipt of an official order for the transformer and spares.

33. LABELS

All apparatus shall be clearly labelled indicating, where necessary, its purpose and service positions.

The material of all labels and plates, their dimensions, legend, and the method of printing shall be subject to the approval of the Purchaser.

Colours shall be permanent and free from fading. All labels and plates for outdoor use shall be of non-corrosive material.

They shall be engraved in English. Nameplates shall carry all the applicable information specified in the applicable items of the Standards and other details as required in this specification. No scratching, corrections or changes will be allowed on nameplates.

Wherever possible the equipment shall carry the markings "**THIS EQUIPMENT IS PROPERTY OF GPL Inc.**".

34. DECALS

“Danger Do Not Open” decal on exterior transformer doors

“Danger Do Not Touch” decal on interior transformer doors

Typical decals shown in Appendix A.

35. GUARANTEE

The Supplier shall provide a guarantee which shall include the following:

- Satisfactory operation during the guarantee period of 24 months from the date of commissioning or 30 months from the date of shipment;

- Performance figures as supplied in the Technical Schedule; and
- No need for maintenance renewal of Corrosion Protection for at least five years from the date of delivery.

36. SUBMITTALS REQUIRED WITH THE BID

The following shall be required in duplicate of three (3) copies:

1. completed technical data schedule for each type and rating of the transformer;
2. descriptive literature giving full technical details of equipment offered;
3. Outline dimension drawings for each major component, general arrangement drawing showing component layout and general schematic diagrams;
4. type test certificates, where available, and sample routine test reports for each type and rating of the transformer;
5. summary reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;
6. details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification;
7. deviations from this specification. Only deviations approved in writing before placement of order shall be accepted; and
8. list of recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements.

21. DRAWINGS/DOCUMENTS:

The following particulars shall be submitted with the Bid

1. General outline drawing showing shipping dimensions and overall dimensions, net weights and shipping weights, quality of insulating oil, location of coolers, marshalling box and tap changers etc.;
2. Assembly drawings of core, windings etc. and weights of main components/parts;
3. Height of centre line on HV and LV connectors of transformers from the rail top level;
4. Dimensions of the largest part to be transported;

5. GA drawings/details of various types of bushing;
6. Tap changing and Name Plate diagram;
7. Type test certificates of similar transformers;
8. Illustrative & descriptive literature of the Transformer and
9. Maintenance and Operating Instructions.

37. SUBMITTALS AFTER CONTRACT AWARD

A. Technical Folders – Hard Copy

The Purchaser shall nominate items of equipment for which the Supplier shall provide two bound Folders of Technical Particulars. Information in respect of each nominated item shall include the following, insofar as applicable:

1. Descriptive literature giving full technical details;
2. Detailed dimensioned drawing;
3. Installation, Commissioning and Operation and Maintenance Instructions;
4. Manufacturers Recommendations regarding spares:
 - a. Commissioning spares
 - b. O&M parts.
 - c. Special tools and equipment required for erection, commissioning, and maintenance.
 5. A Schedule of all special tools and equipment required for erection, commissioning, and maintenance of the equipment.
 6. Calculations validating the Design (If requested by the Purchaser)
 7. Technical data schedule, with approved revisions
 8. Inspection and test reports carried out in the manufacturer's works;

Such folders shall be subject to approval by the Purchaser, who shall reserve the right to call for additional information/data, if in his/her opinion such is required.

B. Technical Folders – Electronic Version

Suppliers shall provide an Electronic Version of the Technical Folders in addition to the hard copy.

C. Drawings and Documentation

1. Schedule for the Production of Drawings

Within 10 days of placement of order, the Supplier shall submit for approval by the Purchaser, a schedule of the drawings to be produced. The schedule shall also provide a program of drawing submittals.

2. Drawings and Document Formats

All detail drawings submitted for approval shall be to scale not less than 1:20. All the important dimensions shall be given and the material of which each part is to be constructed shall be indicated on the drawings. All documents and drawings shall become the property of the Purchaser.

All drawings and calculations, submitted to the Purchaser, shall be on international standard size paper, A0, A1, A2, A3 or A4. All such drawings and calculations shall be provided with a contract title block, which shall include the name of the Purchaser and shall be assigned a unique drawing number.

Lettering sizes and thickness of lettering and lines be selected so that if reduced by two stages to one quarter of their size, the alphanumeric characters and lines are still perfectly legible so as to enable them to be microfilmed.

For presentation of design drawings and circuit documents, IEC Publication 60617 or equivalent standards for graphical symbols are to be followed.

3. Approval Procedures

The Supplier shall submit all drawings, documents, and type test reports for approval in sufficient time to permit modifications to be made if such are deemed necessary and re-submit them for approval without delaying the initial deliveries or completion of the supply. The Purchaser shall endeavor to return them within a period of two weeks from the date of receipt.

Three copies of all drawings shall be submitted for approval and three copies for any subsequent revision. The Purchaser reserves the right to request any further additional information/data that may be considered necessary in order to fully review the drawings. If the Purchaser is satisfied with the drawing, one copy will be returned to the Supplier marked with "Approved" stamp. If the Purchaser is not totally satisfied with the drawing, then "Approved Subject to Comment" status will be given to it and a

comment sheet will be sent to the Supplier. If the drawing submitted does not comply with the requirements of the specification, then it will be given “Not Approved” status and a comment sheet will be sent to the Supplier. In both these cases the Supplier will have to modify the drawing, update the revision column and resubmit for final approval. Following approval, ten copies of the final drawings will be required by the Purchaser.

Any drawing or document submitted for information only should be indicated as such by the Supplier. Drawings and documents submitted for information only will not be returned to the Supplier unless the Purchaser considers that such drawing needs to be approved, in which case they will be returned suitably stamped with comments.

The Supplier shall be responsible for any discrepancies or errors in or omissions from the drawings, whether such drawings have been approved or not by the Purchaser. Approval given by the Purchaser to any drawing shall not relieve the Supplier from his liability to complete the supply in accordance with this specification and the conditions of contract nor exonerate him from any of his guarantees.

4. Electronic Versions of the Drawings & Documentation

Electronic versions of drawings and documentation shall be provided.

14. COMPLETENESS OF SUPPLY

All accessories or fittings not specifically mentioned in the Specification, but which are necessary or usual for similar equipment and for its efficient performance shall be included in the Bid along with full details and price. The attention of the Purchaser should be drawn to it.

38. NON-COMPLIANCE SCHEDULE

On this schedule, the Proponent shall provide a list of non-compliance with this specification, documenting the effects that such non-compliance is likely to have on the transformer/equipment/component life span and operating characteristics. Each non-compliance shall be referred to the relevant specification clause.

Clause No.	Non-Compliance
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39. TEST CERTIFICATE SCHEDULE

On this schedule, a list of the test certificates shall be included with the bid. This list shall include the certificates for the type tests and sample routine test reports. Each certificate listed shall be referred to the relevant specification clause.

Clause No.	Type Test Certificate or Routine Test Report
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CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION
 PLANT GPL-PD-063-2022

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40. TECHNICAL DATA SCHEDULE FOR 60 MVA, 13.8/69KV THREE PHASE
 POWER TRANSFORMER

For submission(s) to be evaluated, Proponent **MUST** complete the form below.

Item	Description	Unit	GPL	Bidder
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No				
1	Rated Power (kVAn - ONAN Rated)	kVA	60,000	Bidder to state.
2	Rated Frequency	Hz	60	Bidder to state.
3	Rated Primary Voltage	kV	69	Bidder to state.
4	Rated Secondary Voltage	V	13,800	Bidder to state.
5	Number of Phases		3	Bidder to state.
6	Transformer Type		Oil Immersed	Bidder to state.
7	HV – LV Vector Group		YNd11	Bidder to state.
8	Cooling Type		ONAN	Bidder to state.
9	No. of Tap Positions/Steps	No.	13	Bidder to state.
10	Max Tap Position (above nominal)	%	5	Bidder to state.
11	Min Tap Position (below nominal)	%	-10	Bidder to state.
12	Tap Steps	%	1.25	Bidder to state.
13	Magnetic Flux Density (one minute at normal tap) (20% overvoltage at 95% of rated frequency)	Tesla	1.5	Bidder to state.
14	No Load Current	A	(1% to 2%) x I_n	Bidder shall provide specific value.
15	No-load Loss at Nominal Tap Position and Rated Primary Voltage	kW	(0.08% to 0.1%) x kVAn x 0.8	Bidder shall provide specific value.

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16	Load Loss at Nominal Tap Position and Rated Load Current	kW	(0.38% to 0.48%) x kVAn x 0.8	Bidder shall provide specific value.
17	Voltage Regulation at Full Load and Power Factor of 1	%	<=1	Bidder shall provide specific value.
18	Voltage Regulation at Full Load and Power Factor of 80%	%	<1.25	Bidder shall provide specific value.
19	Rated Short-circuit withstand Current (HV side/ MV side)	kA	40/65	Bidder to state.
20	Rated Short-circuit Current withstand duration (both sides)	s	10	Bidder to state.
21	Impedance measured at 65 °C and nominal tap position	%	13.3 to 14.22	Bidder shall provide specific value.
22	X/R Ratio	%	18.6	Bidder shall provide specific value.
23	Type of Winding material on HV Side (Copper is the preferred material type)	...	Copper	Bidder to state.
24	Type of Winding material on LV Side (Copper is the preferred material type)	...	Copper	Bidder to state.
25	Connections - HV windings		Wye with neutral	Bidder to state.
26	Connections - MV windings		Delta	Bidder to state.
	Transformer Oil			
27	Oil type		Class 1 mineral oil conforming to ASTM D3487	Bidder to state.

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28	Dielectric strength of the oil	kV	>40	Bidder shall provide specific value.
Overloading				
29	Duration of 25% Overload at Service Conditions	minutes	180	Bidder to state.
30	Duration of 50% Overload at Service Conditions	minutes	90	Bidder to state.
Temperature Rise				
31	Design maximum outdoor temperature	°C	40	Bidder to state.
32	Design continuous ambient temperature	°C	35	Bidder to state.
33	Minimum ambient temperature	°C	15	Bidder to state.
34	Maximum temperature rise over ambient temperature:			Bidder to state.
	a) In oil by thermometer	°C	65	Bidder to state.
	b) In winding by resistance measurement	°C	65	Bidder to state.
	c) Limit for hot spot temperature for which the transformer is designed	°C	<80	Bidder shall provide specific value.
	d) Temperature gradient between windings and oil	°C	20	Bidder to state.
	e) Type and details of winding hot spot temperature detector		Resistance temperature detector	Bidder to state.
	f) Type of maximum winding temperature indicator		analog/digital	Bidder to state.
35	Average Winding Temperature Rise	°C	65	Bidder to state.
36	Maximum Winding Temperature Rise	°C	105	Bidder to state.

General Transformer Data				
37	Manufacturer	...		Bidder to state.
38	Type		double wound, sealed type, oil immersed with natural oil cooling	Bidder to state.
39	Operating flux density	Tesla	1.5	Bidder to state.
40	Manufacturer's data sheet supplied	YES/NO	YES	Bidder to state.
Windings/Coils				
41	Conductor for HV Winding - Manufacturer/Supplier			Bidder to state.
42	Conductor Material for HV Winding		Copper	Bidder to state.
43	Conductor for MV Winding - Manufacturer/Supplier			Bidder to state.
44	Conductor Material for MV Winding		Copper	Bidder to state.
Bushings & Terminals				
45	Type of bushing insulator - HV		porcelain	Bidder to state.
46	Type of bushing insulator - MV		porcelain	Bidder to state.
47	Type of bushing insulator - Neutral		porcelain	Bidder to state.
48	Voltage rating HV Bushing	kV	72.5	Bidder to state.
49	Voltage rating MV Bushing	kV	15	Bidder to state.
50	Current rating HV Bushing	A	2 x In of transformer	Bidder shall provide specific value.

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51	Current rating MV Bushing	A	2 x In of transformer	Bidder shall provide specific value.
52	HV Bushing BIL	kV	350	Bidder to state.
53	HV Busing Power Frequency withstand Voltage - Dry	kV	160	Bidder to state.
54	HV Busing Power Frequency withstand Voltage - Wet	kV	140	Bidder to state.
55	Type and Metal used in HV Terminal			Bidder to state.
56	MV Busing Power Frequency withstand Voltage - Dry	kV	36	Bidder to state.
57	MV Busing Power Frequency withstand Voltage - Wet	kV	30	Bidder to state.
58	Type and Metal used in MV Terminal			Bidder to state.
59	Type and Metal used in Earth Terminal			Bidder to state.
60	Busing Type		outdoor type and easily replaceable	Bidder to state.
61	Creepage Distance (minimum) line to line	mm/kV	25	Bidder to state.
62	Creepage Distance (minimum) line to ground	mm/kV	44	Bidder to state.
Bushing Clearance				
63	Minimum phase to phase clearance HV	mm	700	Bidder to state.
64	Minimum earth to phase clearance	mm	700	Bidder to state.
65	Minimum phase to phase clearance MV	mm	200	Bidder to state.
66	Spring and lock washer included	YES/NO	YES	Bidder to state.

Tap Changer				
67	Tap Changer Catalogue Details Attached	YES/ NO	YES	Bidder to state.
68	Can the Tap Changer switch be Locked	YES/ NO	YES	Bidder to state.
Details of CT in the Bushing to be provided :				
69	MV CT		2000:5 0.5/5P20 20VA/20VA	Bidder to state.
70	HV CT		600:5 0.5/5P20 20VA/20VA	Bidder to state.
71	HV - Neutral CT		200:5 0.5/5P20 20VA/20VA	Bidder to state.
Tank				
72	Tank material		construction steel	
73	Thickness of the metal sheet	mm	≥11	Bidder shall provide specific value.
74	Painting method details attached	YES/ NO	YES	Bidder to state.
Tank (for information purposes only)				
75	Tank Width	mm		Bidder to state.
76	Tank Height	mm		Bidder to state.
77	Tank Dept (length)	mm		Bidder to state.
78	Weight of Core and Windings	kg		Bidder to state.
79	Weight of Tank	kg		Bidder to state.

CONSTRUCTION OF 25MW +/- 5% HFO-FIRED POWER GENERATION
PLANT GPL-PD-063-2022

80	Weight of Oil at 20 °C	kg		Bidder to state.
81	Total weight of Transformer without oil	kg		Bidder to state.
82	Shipping weight of Transformer	kg		Bidder to state.

Name:.....
.....

Affix Company
Seal Below

Signature:.....
.....

Date:.....
.....