PNG POWER Ltd

TENDER

FOR

SUPPLY AND DELIVERY OF
1000 KW CONTAINERISED GENERATING SET
AND 1250KVA GENERATOR STEP-UP TRANSFORMER

Tender No. 25/2017

Prepared by the Project Delivery Group, Asset Development Business Unit

Papua New Guinea (PNG) Limited
PO Box 1105
Boroko 111
National Head Office
Level 3, Corner Wards Road, Gordia Street, Hohola
Port Moresby
Papua New Guinea

Telephone: (+675) 324 3200 / (+675) 324 3260
Facsimile: (+675) 325 0072 – Registry
Website: www.pngpower.com.pg

September 2017

INVITATION TO TENDER

PNG Power Ltd (PPL) invites Tenders for the Procurement of a 1000kW Containerised Generating Set and 1250kVA Generator Step-up Transformer for its Buka Power Station in the Autonomous Region of Bougainville of Papua New Guinea.

The scope is generally the supply and delivery of the above package and the specifications are provided in the Employer's Requirements.

The Invitation to Tender sets out the details of the intended Contract, the process and conditions for submission of a Tender, and the information required with the Tender. The **"Invitation to Tender"** comprises the following documents as titled, with their annexes and references:

- Part A: Instructions to Tenderers, comprising:
  - Instructions and conditions for tendering,
  - Draft Letter of Tender
- Part B: Tender Schedules (Pricing Schedules and Technical Schedules) and other forms to be completed by the Tenderer.
- Part C: Conditions of Contract, with draft form of Contract Agreement and other associated forms.
- Part D: Employer's Requirements.

The documents should be read in the order listed above, using the cross-referencing they include to best gain an understanding of the project. Particularly, we suggest that you read the Instructions to Tenderers first. They set out the basis upon which you should tender, together with important procedures for the tender period.

TENDER NO. 25/2017

PART A: INSTRUCTIONS TO TENDERERS

CONTENTS

1. Tender Closing Time

(a) The closing time for submission of Tenders is 4:00 PM, PNG time, on Friday 20th October, 2017.

(b) There will be no public opening of Tenders.

(c) Tenders received after the Tender Closing Time may at the sole and absolute discretion of the PNG Power Ltd be returned unopened to the Tenderer, if the Tender Opening Committee considers the Tenderer to be at fault.

(d) PNG Power Ltd may, in its sole and absolute discretion, extend the Tender Closing Time. If PNG Power Ltd extends the Tender Closing Time, it will notify each of the Tenderers in writing.

2. Submission of Tender

(a) The Tender shall be place in sealed envelopes marked with the word "Tender" followed by Tender No. shown on the Tender Document and addressed to:

The Chairman – Tender Opening Committee
PNG Power Ltd
P.O Box 1105
BOROKO,
National Capital District
Papua New Guinea

(b) Tenders must be placed in tender box located in the PNG Power Ltd National Office, Wards Road, Hohola before the closing time and date stated in clause 2.1 of this Invitation to Tender. PNG Power Ltd shall take all precautions to ensure that tenders received by mail, air freight or courier are placed in the tender box immediately upon receipts, but accept no liability for error or omission in this regard.

(c) Tenders (or any part of a Tender) delivered by facsimile or email will not be accepted or considered by PNG Power Ltd.

(d) The original hard copy and one duplicate copy of the Tender shall be submitted.

(e) The Tenderer must clearly identify the original and the duplicate copy of the Tender. The Tenderer must ensure that the copy is a true copy of the original in all respects. The original will take precedence over the copy.

(f) The Tenderer licenses PNG Power Ltd to reproduce the whole or any portion of a Tender for the purposes of Tender evaluation, despite any copyright or other intellectual property right that may subsist in the Tender.

3. Documents Comprising the Tender

The following documents comprise the Tender to be submitted:

1. completed and signed Letter of Tender in accordance with the draft in Appendix A of these Instructions;

2. completed forms as included in the appendices of these Instructions;

3. fully completed Tender Schedules;

4. technical specifications of the generating set package and the transformer to be supplied;

5. tender drawings of the equipment to be supplied.

6. detail programme for the supply and delivery of the equipment.

4. Alternative Tenders

(a) Tenderers are required to submit their conforming Tender strictly in accordance with this Invitation to Tender.

(b) Tenderers may also submit an alternative Tender which may be considered by PNG Power Ltd, in its sole and absolute discretion.

(c) Any alternative Tender must satisfy the specific performance required by the Employer's Requirements.

(d) Any alternative Tender must also be fully described and priced, demonstrate in detail that the specific performance requirements will be achieved or exceeded together with reasons as to why the alternative may be advantageous and provide full details of all non-conformances against a confirming Tender. Any alternative Tender must be submitted in the same number of copies as the Tender in accordance with clause 2.4 of this Invitation to Tender.

5. Eligibility and Qualification Requirements

The Tenderer shall be an established manufacturer of the electrical plant and equipment or an established agent representing the manufacturer.

To be eligible for award of Contract, Tenderers shall provide evidence satisfactory to the Employer of their capability and adequacy of resources effectively to carry out the subject contract.

The Tenderer shall submit evidence to show that he has the technical and financial capability to undertake the Contract. In addition to the manufacturing experience, the equipment supplied shall have the record of being in commercial operation in good condition for not less than three years. For evidencing the above, the Tenderer shall attach to his Tender a statement of equipment supplied by the Tenderer and certificates of the user or consulting engineer supporting the said works and record of commercial operation in good condition.

6. Tender for the whole works

The Tender shall be for the whole of the Works. Tenders for a part only of the Works shall not be considered.

7. Cost of Tendering

The Tenderer will bear all costs associated with the preparation and submission of its Tender and PNG Power Ltd will not in any way or in any circumstances be responsible or liable for any such costs, regardless of the conduct or outcome of the tendering process.

8. Tenderer to Inform Himself Fully

Tenderers shall make or cause to be made on their behalf local enquires and shall obtained for themselves on their own responsibility all information which may be necessary for making a Tender and entering into Contract and shall examine the Tender Documents in order to ascertain the matters as to which they will deemed to have satisfied themselves and obligations which they are to undertake.

9. Tender Security

There will be significant expenses incurred by PNG Power Ltd should the project be delayed by an event such as a withdrawn tender. However, PNG Power Ltd prefers not to burden the Tenderer with a Tender Security, trusting that both parties will exercise good faith during the tender evaluation and clarifications period to result in an executable contract agreeable to both.

10. Enquiries during the Tendering Period

Any enquiries or clarifications in respect of the Works prior to the Tender Closing Time shall be addressed to:

Mr. Vincent Pilakvue
Manager Project Delivery
PNG Power Ltd
P.O Box 1105
BOROKO, NCD
Papua New Guinea

Email: vpilakvue@pngpower.com.pg

No verbal requests for information or clarifications will be accepted.

11. Informal Tenders

Any Tender may be rejected:

- If not delivered in a sealed envelope as prescribed at or before the prescribed hour at the place specified for receiving Tenders;
- If not signed by the Tenderer and witnessed in all the required places;
- If not accompanied by all of the Schedules completed in all respects;
- If the Tender does not comply with these Conditions of Tendering or any annexed additional Conditions of Tendering;
- If not accompanied by a Tender Deposit where specified.

- In the case of Corporations, if the Tender is not signed under seal.

12. Tender Validity Period

Unless otherwise specified in the Letter of Tender, the Tender shall be open for acceptance for a period of not less than one hundred and eighty (180) days after the closing date for the lodging of Tender

13. Local and Foreign Currency

For Tenders requiring work to be performed onshore (in PNG), all prices in the Quotation shall be split into local currency (on-shore component) and the foreign currency (off-shore component).

For the purpose of recording bids at Tender opening in the same monetary terms, the foreign currency component shall be converted to equivalent PNG currency (Kina) at the applied rate of exchange.

The applied rate of exchange shall be the Bank of South Pacific's official selling rate applicable 28 days before the Tender closing date. The rate will be sent to all Tenderers soon after the 28 days before Tender closing date.

14. Evaluation of Tender

(a) PNG Power Ltd may require further information from the Tenderer for the purposes of clarification or explanation of their bids.

(b) After the Tender Evaluation Time, PNG Power Ltd reserves the right to, at any time, and from time to time, negotiate with any one or more of the Tenderers.

(c) PNG Power Ltd may negotiate with any one or more of the Tenderers to vary a Quotation on the grounds of technical capability, its cost and effectiveness or any other relevant or appropriate matter.

(d) For the purpose of comparison of Quotations, the amount of the currencies in which the prices have been stated in each quotation, will be converted to Papua New Guinea Kina at the selling rates of exchanges published by Bank South Pacific applicable to similar transactions at the close of business on the closing date of quotations.

(e) PNG Power Ltd may evaluate Quotations, against any or all of the following criteria:

- Price
- Conformity with the Employer's Requirements
- Relevant previous experience, technical and financial capability in similar projects
- Time for Completion

15. Customs Duty

Goods imported for incorporation into the Works will be subject to Customs duty at the rate applicable to the tariff item under which the goods are imported.

Tenderers must allow for import duty and general levy as separate items in the Tender Price structure and must enter the amounts allowed and the basis of the calculations on the appropriate schedule.

The Employer will reimburse only the actual amounts paid for duty as evidenced by PNG Customs documentation and receipts for amounts paid.

In the event that the Employer is successful in obtaining any exemption from Customs Duty, the Contract Price shall be reduced accordingly.

The Contractor's equipment, to be imported for the purposes of performing the Contract, but which will not be incorporated into the Works, are subject to Customs duty at the appropriate tariff item rates.

Tenders must state the amount allowed for Customs duty on Contractors equipment and must show the basis of calculation.

The Employer will require the Contractor to make appropriate representation to the PNG Bureau of Customs, to have the Contractor's equipment entered under security for the duration of the Contract.

In the event that PNG Bureau of Customs permits "under security" entry of the Contractor's equipment, the Contract Price shall be reduced accordingly.

The Employer will reimburse the Contractor for the cost of providing the security to Customs on production of documentary evidence of the expenditure.

16. Taxation

16.1 Local Taxation

The prices bid by Tenderer shall include all business taxes, income and other taxes that may be levied according to the laws and regulations in being at the time of Tendering in PNG on the equipment, materials and supplies (both permanent, temporary and consumable) and acquired for the purpose of the Contract and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to conform to PNG taxation laws.

16.2 Personal Income Tax

The Contractor's staff, personnel and labour will be liable to pay personal income taxes in PNG in respect of such of their salaries and wages as are chargeable under the laws and regulations in force for the time being, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

16.3 Taxation Enquiries

Tenderers' attention is directed to Part III Division 14A of the Papua New Guinea Income Tax Act relating to Foreign (Non-Resident) Contractors.

Tenderers must fully acquaint themselves with the requirements of the PNG Taxation Office. The Employer will not be responsible for payments arising from failure of the successful Tenderer to make detailed enquiries of the Taxation Office.

Enquiries should be directed to: -

Foreign Contractors Section
Internal Revenue Commission
P.O. Box 777
Port Moresby, PNG
Fax: (675) 3 214249
Phone: (675) 3 226628

17. Insurance

For Turnkey Contracts, unless otherwise advised before the issue of the Letter of Acceptance, the successful Tenderer will be required, as a Condition of Contract, to arrange for insurance in respect of risks situated in PNG to be placed with a broker or an insurer licensed to operate in PNG.

The cost of all Insurances required under the Conditions of Contract (over and above those taken out by the Employer) shall be included in the Tender Prices.

The Tender shall state the name of the Insurance Company proposed together with the cost of each form of Insurance.

18. Acceptance of Tender

(a) PNG Power Ltd is under no obligation to accept the lowest or any Tender it receives.

(b) If PNG Power Ltd decides to accept a Tender, a Letter of Acceptance will be issued to the successful Tenderer who shall forthwith enter into a Formal Agreement for the execution of the Works. The Letter of Acceptance shall constitute a binding Contract between PNG Power Ltd and the successful Tenderer, whether such Formal Agreement is or is not subsequently executed.

(c) In the event of the successful Tenderer failing to enter into a Formal Agreement with PNG Power Ltd, it may annul the acceptance of the Tender.

(d) No Tender shall be deemed to have been accepted unless and until the fact of such acceptance has been notified in writing to the successful Tenderer by PNG Power Ltd.

(e) After acceptance of the Tender, the documents will form the evidence of Terms of Contract between PNG Power Ltd and the Tenderer.

19. Performance Security

The Tenderer whose Tender has been accepted shall, within fourteen days of receipt of the Letter of Acceptance, acknowledge its receipt to the Employer and in accordance with the of the Conditions of Contract, deposit with the Employer the Performance Security in the amount specified in the letter of acceptance.

The Performance Security is required to be lodged in cash. However, the Employer will consider a request from the Contractor to lodge the Performance Security in the form of a Bank Guarantee or Insurance Bond.

In the event that the Employer agrees to accept a Bank Guarantee or Insurance Bond in lieu of cash, the Guarantee or Bond must be irrevocable and unconditional, be denominated in PNG currency and be issued by a bank or insurance company established, resident or represented in PNG.

The Guarantee or Bond shall be drawn up in manner acceptable to the Employer and shall be similar to the appropriate specimen form included in this document.

The Employer may, by letter to the successful Tenderer, annul the acceptance of the Tender if the said Performance Security is not lodged in accordance with the Conditions of Contract.

In accordance with the Conditions of Contract the successful Tenderer shall within twenty-eight days of being called upon by notice in writing to do so, execute the agreements supplied with the tender documents. In the event of the Tenderer not executing such Agreement his Tender may be deemed to be rejected, in which event the Employer may without prejudice to any other rights:

- Annul the acceptance of the Tender and/or
- Declare the Tender Deposit forfeited to the Employer; and/or
- Re-advertise or circulate the Specification or any part thereof and/or
- Accept another Tender.

Appendix A Letter of Tender

LETTER OF TENDER

Tender Number 25/2017
Supply and Delivery of 1000kW Containerized Generating Set and 1250kVA Generator Step-up Transformer

TO: Chairman - Tender Opening Committee
PNG Power Limited
P.O. Box 1105
Boroko, N.C.D.
Papua New Guinea

We have examined the Conditions of Contract, Employer's Requirements, Schedules, the attached Appendix and Addenda Nos for the execution of the above-named Works. We offer to execute and complete the Works and remedy any defects therein in conformity with this Tender which includes all these documents, for the sum of (in currencies of payment)

_____

or such other sum as may be determined in accordance with the Conditions of Contract.

We accept your suggestions for the appointment of the DAB, as set out in Schedule

> [We *have completed the Schedule by adding our suggestions for the other Member of the DAB, but these suggestions are not conditions of this offer*]. *

We agree to abide by this Tender until _____ and it shall remain binding upon us and may be accepted at any time before that date. We acknowledge that the Appendix forms part of this Letter of Tender.

If this offer is accepted, we will provide the specified Performance Security, commence the Works as soon as is reasonably practicable after the Commencement Date, and complete the Works in accordance with the above-named documents within the Time for Completion.

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

We understand that you are not bound to accept the lowest or any tender you may receive.

Signature _____ in the capacity of _____

duly authorised to sign tenders for and on behalf of _____
_____

Address: _____
_____

Date: _____

* If the Tenderer does not accept, this paragraph may be deleted and replaced by:

> We do not accept your suggestions for the appointment of the DAB. We have included our suggestions in the Schedule, but these suggestions are not conditions of this offer. If these suggestions are not acceptable to you, we propose that the DAB be jointly appointed in accordance with Sub-Clause 20.2 of the Conditions of Contract.

TENDER NO. 25/2017

PART B: TENDER SCHEDULES

CONTENTS

1. Price Schedules

The Tenderer is required to complete the following Price Schedules that shall form the basis for all payments under the contract.

No.	Description	Unit	Qty	Unit Price		Total Price	
				CIF	Local	Foreign	Local
1	Generating Set Package	Set	1				
2	Step-up Transformer	Nos	1				
3	Special Tools						
4	Initial Service Parts						
SUB-TOTAL (excluding 10% GST)							
TOTAL CONTRACT VALUE (including 10% GST)							

2. Technical Particulars and Guarantees

The prospective Tenderers are required to complete the following technical schedules for the equipment offered in their tenders. There shall be no equipment offered without filling these schedules. These sheets to be copied and filled in separately for each different type of equipment offered.

The Tenderers shall complete or accept as appropriate, all items in these technical schedules.

No.	Item	Unit	Tendered Data
A	**ENGINE**		
	L.C.V. of the fuel used	kcal/kg	
	Net electrical power output at the generator terminals corresponding to full load at Site conditions	kWe	
	Heat rate at above rating, (without tolerances)	kcal/kWh	
	75% of the above full load	kcal/kWh	
	50% of the above full load	kcal/kWh	
	Average percentage availability for ten years	%	
A1	**General Data**		
	Manufacturer		
	Make/Model		
	Type; in-line or vee		
	Number of cylinders		
	Stroke, two or four		
	Rated Speed	rpm	
	Rating at full load	kW	
	B.M.E.P at full load	kPa	
	Recommended fuel		
	Design life for base load generation	years	
	Number of years in service as a base load generating set	years	
	Weight of complete unit including skid base	kg	
	Dimensions of assembled unit: L x W x H	mm	
A2	**Performance Characteristics**		
	(a) At I.S.O 3046 Standard Conditions		
	Full load rating of generator	kW	
	Overload rating of generator	kW	
	Heat rate at full load rating based on net power output and L.C.V of fuel	kcal/kWh	
	(Note: Net power output is the output at the generator terminals less parasitic load).		
	(b) <u>At Site</u>		
	Full load rating at generator terminals	kW	
	Overload rating at generator terminals	kW	
	Heat rate based on net power output and L.C.V. of fuel:	kcal/kWh	
	Full load	kcal/kWh	
	90% full load	kcal/kWh	
	50% full load	kcal/kWh	

No.	Item	Unit	Tendered Data
	110% full load	kcal/kWh	
	(Note: the heat rate figures shall be for the site conditions)		
	L.C.V. of fuel used	kcal/kg	
	Lubricating oil consumption at full load	l/hr	
	Exhaust temperature at cylinder outlet (at full load)	^{o}C	
	Total parasitic load	kW	
A3	**Governor**		
	Make		
	Type of governor (electrical or mechanical)		
	Droop range	%	
	RPM range	rpm	
	Control voltage (electronic)	V DC	
	Shut-down solenoid voltage	V DC	
	Is solenoid energised to run		
A4	**Noise**		
	Maximum noise level measured at one metre from the engine	dBA	
	Maximum noise level measured at forty (40) metres from the engine	dBA	
A5	**Vibration**		
	Readings provided as specified in the Technical Specification		
A6	**Fuel Oil System**		
	Is fuel pump engine driven		
	Is a return tank required		
	Type of fuel filter		
	Number of fuel filter elements		
A7	**Exhaust System**		
	Type of silencer		
	Size of silencer (diameter x length)	mm	
	Weight of silencer	kg	
	Maximum noise level one metre from the silencer	dBA	
	Are all fittings supplied?		
A8	**Lubricating Oil System**		
	Type of lubricating oil pump		
	Is lubricating oil pump engine driven		
	Type of lubricating oil filter		
	Number of filter elements		
	Capacity of sump	Litres	
	Recommended lubricating oil		

No.	Item	Unit	Tendered Data
A9	**Cooling System**		
	Capacity of cooling system	Litres	
	Name of scale and corrosion inhibitor		
	Method of adding inhibitor		
	Are manufacturers coolant treatment cartridges fitted		
	Thermostatic valve operating temperature	°C	
A10	**Radiator**		
	Make		
	Type		
	Dry weight	kg	
	Wet weight	kg	
	Size: Length x Width x Heigh	mm	
	Stand - Ground clearance	mm	
	Design pressure	kPa	
A11	**Engine Starting**		
	Starting voltage	V DC	
	Number of batteries supplied		
	Type of battery		
	Capacity of battery (Ampere hours)	AH	
	Make of starting motor (electric)		
A12	**Safety Devices**		
	Type of overspeed devices: - Mechanical - Electrical		
	Setting of overspeed device: - Mechanical - Electrical		
	Does mechanical O/S device operate fuel rack directly?		
	Is overcrank switch fitted		
	Time setting for overcrank switch	s	
	Lubricating oil low pressure alarm	kPa	
	Lubricating oil low pressure trip	kPa	
	Lubricating oil high temperature alarm	°C	
	Lubricating oil high temperature trip	°C	
	Jacket water high temperature alarm	°C	
	Jacket water high temperature trip	°C	
B	**ALTERNATOR**		
B1	**General Data**		
	Manufacturer		

No.	Item	Unit	Tendered Data
	Model/Type		
	Type of Enclosure (Protection)		
	Method of Cooling		
	Class of Insulation		
B2	**Ratings**		
	Maximum continuous rated output	kW	
	Maximum continuous output at rated PF lagging	kW	
	Rated power factor lagging		
	Rated terminal voltage (AC)	V	
	Permissible range of terminal voltage	%	
	Rated phase current at maximum continuous rating	A	
	Short circuit ratio at rated voltage and current		
	Rated Speed	rpm	
	Rated Frequency	Hz	
	$(I_2)^2t$ maximum value		
	Field current at maximum continuous rating (DC)	A	
	Field current at no-load rated voltage	A	
B3	**Generator Efficiencies at Rated Power Factor**		
	110% load	%	
	100% load	%	
	75% load	%	
	50% load	%	
	30% load	%	
B4	**Automatic Voltage Regulator**		
	Make / Type		
	Range of adjustment of generator voltage (Automatic)		
	Range of adjustment of generator voltage (Manual)		
	Response time for 2% deviation in generator voltage	ms	
	Momentary over-voltage when shedding rated load	V DC	
	Excitation system ceiling voltage at no load	V DC	
	Excitation system ceiling voltage at full load	V DC	
C	**STEP-UP TRANSFORMER**		
	Manufacturer		
	Make / Model		
	Type		
	Continuous maximum rating (ONAN/ONAF)	kVA	
	Number of phases		
	Vector Group		

No.	Item	Unit	Tendered Data
	Transformer Nominal Ratio	kV	
	Frequency	Hz	
	High Voltage	kV	
	Low Voltage	V	
	HV Current	A	
	LV Current	A	
	HV winding connection		
	LV winding connection		
	Type of Cooling (ONAN / ONAF)		
	Service conditions:		
	- Altitude not exceeding	m	
	- Air temperature not exceeding	^{0}C	
	Guaranteed Losses at nominal ratio:		
	(a) No Load losses	W	
	(b) Copper losses at Continuous Max Rating	W	
	Impedance @ 75°C	%	
	Tap Switch Type		
	Maximum Winding Temperature Rise	°C	
	Class of Insulation		
	Type of Insulation & cooling Liquid		
	Mass (Gross)	kg	
	Volume of Oil	Litres	
D	**CONTAINER (ACOUSTIC ENCLOSURE)**		
	Make		
	Dimensions (L x W x H)		
	Fuel Tank Capacity		
	Dry Weight		
	Noise Level @ 1 metre		

3. Schedule of Departures

All deviations to the commercial and contractual provisions shall be forwarded in the format given below. Any details that will lead to deductions of final tender price shall not be inserted.

Clause No.	Proposed Deviation

4. Schedule of Special Tools

The Tenderer shall list all special tools for servicing and maintenance which have been included in the offer. The price for each item of equipment shall be listed below. The total cost of the test equipment and special tools shall be included in the appropriate column of the Price Schedules.

Equipment	Price

5. Schedule of Initial Service Parts

The tenderer shall provide a list of parts required for the first 500 hours of service. Each item shall be priced and listed below. The total cost of these parts shall be included in the appropriate column of the Price Schedules.

Part No.	Description	Quantity	Price

TENDER NO. 25/2017

PART C: CONDITIONS OF CONTRACT

CONTENTS

1. General Conditions

The Conditions of Contract comprise the "General Conditions", which form part of the "Conditions of Contract for Plant and Design Build" First Edition 1999 published by FIDIC, and the following "Particular Conditions", which include amendments and additions to those General Conditions.

2. Particular Conditions

The Particular Conditions:

(a) apply to the delivery of the works by the Contractor; and

(b) form part of the Contract Documents comprising the Agreement.

The following Particular Conditions modify and extend the General Conditions, and include clauses additional to the General Conditions. The Particular Conditions that amend the General Conditions are referenced to the clause number used in the General Conditions.

General Conditions clause reference	Particular Conditions
1.1 Definitions	These definitions modify and extend the definitions described in the General Conditions. 1.1.2.2 The **"Employer"** is PNG Power Ltd (**"PPL"**). 1.1.2.4 The **"Engineer"** shall be the Manager Project Delivery of PNG Power Ltd. 1.1.3.2 **"Commencement Date"** shall be the date of the Letter of Acceptance unless another date is specified in the Letter of Acceptance. 1.1.4.6 *Delete the Sub-Clause 1.1.4.6 and substitute with:* Subject to approval of the Bank of Papua New Guinea, payments to the Contractor will be made in the currencies and amounts nominated in the Tender. 1.1.6.2 The Country is Papua New Guinea (**"PNG"**).
1.4 Law and Language	*Delete second and third paragraphs and replace with:* "All language shall be in English."

General Conditions clause reference	Particular Conditions
1.15 **Good Faith**	*Add new clause:* Each party agrees to do all things and execute all deeds, instruments, transfers or other documents as may be necessary or desirable to give full effect to the provisions of the Contract (including these Particular Conditions) and the transactions contemplated by it. Either Party will immediately inform the other Party if it becomes aware of any problems, limitations or other issues which may in any way affect the delivery of the Works or the performance of the Contract. The Parties will co-operate in good faith to resolve any problems, limitations or other issues identified by a Party.
3.4 **Replacement of the Engineer**	*Delete the paragraph and replace with:* "The Employer shall be free at any time, by notice in writing to the Contractor, to appoint another person to act as replacement of the Engineer".
4.2 **Performance Security**	*Add after the first paragraph:* The amount of Performance Security is stated in Annex 1. It may be expressed in Local Currency and the currency of the Contractor's country in proportion to the local and foreign components of the Contract Price. The Performance Security shall be in the form of a Bank Guarantee as shown in Annex 2A
7.1 **Manner of Execution**	*Insert the following after point (b):* "to the satisfaction of the Engineer and"
7.7 **Ownership of Plant and Materials**	*Add new paragraph:* Such passage of ownership does not relieve the Contractor from its obligations for care, maintenance, remedying and insurance of the Works prior to Taking Over.

General Conditions clause reference	Particular Conditions
14.4 Schedule of Payments	*Delete and substitute with:* For both Offshore and Onshore Suppliers, the following terms of payment shall apply: (a) 20% of the Contract Sum upon award of Contract. (b) 30% of the Contract Sum upon plant being shipped CIF to site. This is to be confirmed by receipt of original Bill of Ladding (BOL) (with Express Release) and original Commercial Invoice. (c) 40% of the Contract Sum after successful inspection of equipment at site. (d) 7.5% of the Contract Sum after successful completion of Commissioning. (d) the remaining 2.5% upon the issue of the Certificate of Final Completion on expiry of Defects Liability Period.
14.15 Currencies of Payment	*Insert the following after the first sentence:* "and subject to approval of the Bank of Papua New Guinea".
18.1 General Requirements for Insurance	*Add after the first paragraph:* The Contractor is the "insuring Party".
21.1 Bribery and Corruption	*Add new Sub-Clause:* Any commission, advantage, gift, gratuity, reward or bribe given, promised or offered by or on behalf of the Contractor or his Agent or Servant or any other person on his or their behalf to any officer, servant representative or agent of the Employer or of the Engineer or to any person on their behalf in relation to the obtaining or to the execution of this or of any other contract with the Employer will, in addition to any criminal liability which may be thereby incurred, be a cause at the Employer's discretion for cancellation of this and all other contracts which he may have entered into with the Employer and also to the payment of any loss or damage resulting from such cancellation. The Employer shall be entitled upon a certificate in writing from the Engineer either to deduct the amount of loss and/or damage so certified from any monies otherwise due to the Contractor under this or any other contract or to recover the said amounts as a debt due or partly the one and partly the other as the Employer shall deem advisable.

Annex 1 Data to the Conditions of Contract

	Item	Sub-Clause	Entry
1.	Employer's Name and address	1.1.2.2 & 1.3	PNG Power Ltd P.O Box 1105 BOROKO, NCD Papua New Guinea
2.	Contractor's name and address	1.1.2.3 & 1.3	_____ _____ _____
3.	Engineer's name and address	1.1.2.4 & 1.3	TBA
4.	Commencement Date	1.1.3.2	_____
5.	Time for Completion of the Works	1.1.3.3	_____ days
6.	Defects Notification Period	1.1.3.7	12 months
7.	Performance Security	4.2	5% of the Contract Price

ANNEX 2A FORM OF PERFORMANCE SECURITY BANK GUARANTEE

Brief description of Contract **Tender No. 25/2017**
Supply and Delivery of Genset and Step-up Transformer for Buka Power Station

Name and address of Beneficiary

PNG Power Ltd
Wards Road
Hohola
National Capital District
Papua New Guinea (***PNG Power*** whom the Contract defines as the Employer).

We have been informed that _____ (hereinafter called the 'Principal') is your contractor under such Contract, which requires him to obtain a performance security.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (the "guaranteed amount", say: _____) upon receipt by us of your demand in writing and your written statement stating:

(a) that the Principal is in breach of his obligation(s) under the Contract, and

(a) the respect in which the Principal is in breach.

Following the receipt by us of an authenticated copy of the taking-over certificate for the whole of the works under clause 10 of the conditions of the Contract, such guaranteed amount shall be reduced by _____ % and we shall promptly notify you that we have received such certificate and have reduced the guaranteed amount accordingly.

Any demand for payment must contain your directors' signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 70 days after the expected expiry of the Defects Notification Period for the Works*) _____ (the 'expiry date'), when this guarantee shall expire and shall be returned to us.

We have been informed that the Beneficiary may require the Principal to extend this guarantee if the performance certificate under the Contract has not been issued by the date 28 days prior to such expiry date. We undertake to pay you such guaranteed amount upon receipt by us, within such period of 28 days, of your demand in writing and your written statement that the performance certificate has not been issued, for reasons attributable to the Principal, and that this guarantee has not been extended.

This guarantee shall be governed by the laws of and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date: _____ Signature(s): _____

ANNEX 2B FORM OF RETENTION MONEY GUARANTEE

Brief description of Contract **Tender No. 25/2017**
Supply and Delivery of Genset and Step-up Transformer for Buka Power Station

Name and address of Beneficiary

PNG Power Ltd
Wards Road
Hohola
National Capital District
Papua New Guinea (***PNG Power*** whom the Contract defines as the Employer)

We have been informed that _____ (hereinafter called the 'Principal') is your contractor under such Contract and wishes to receive early payment of [part of] the retention money, for which the Contract requires him to obtain a guarantee.

At the request of the Principal, we (*name of bank*) _____ hereby irrevocably undertake to pay you, the Beneficiary/Employer, any sum or sums not exceeding in total the amount of _____ (the "guaranteed amount", say: _____) upon receipt by us of your demand in writing and your written statement stating:

(a) that the Principal has failed to carry out his obligation(s) to rectify certain defect(s) for which he is responsible under the Contract, and

(b) the nature of such defect(s).

At any time, our liability under this guarantee shall not exceed the total amount of retention money released to the Principal by you, as evidenced by your notices issued under sub-clause 14.6 of the conditions of the Contract with a copy being passed to us.

Any demand for payment must contain your signature(s) which must be authenticated by your bankers or by a notary public. The authenticated demand and statement must be received by us at this office on or before (*the date 70 days after the expected expiry of the Defects Notification Period for the Works*) _____ (the 'expiry date'), when this guarantee shall expire and shall be returned to us.

We have been informed that the Beneficiary may require the Principal to extend this guarantee if the performance certificate under the Contract has not been issued by the date 28 days prior to such expiry date. We undertake to pay you such guaranteed amount upon receipt by us, within such period of 28 days, of your demand in writing and your written statement that the performance certificate has not been issued, for reasons attributable to the Principal, and that this guarantee has not been extended.

This guarantee shall be governed by the laws of and shall be subject to the Uniform Rules for Demand Guarantees, published as number 458 by the International Chamber of Commerce, except as stated above.

Date: _____ Signature(s): _____

ANNEX 3 FORM OF CONTRACT AGREEMENT

This Agreement made the _____ day of _____ 2017.

Between **PNG Power Ltd,** of Port Moresby, Papua New Guinea (hereinafter called 'the Employer') of the one part,

and _____ of _____ (hereinafter called 'the Contractor') of the other part

Whereas the Employer desires that the Works known as Supply & Delivery of 1MW Genset and Transformer for Buka Power Station should be executed by the Contractor, and has accepted a Tender by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree 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 shall be deemed to form and be read and construed as part of this Agreement:

   (a) The Letter of Acceptance dated _____

   (b) The Letter of Tender dated _____

   (c) The Addenda nos. _____

   (d) The Conditions of Contract

   (e) The Employer's Requirement

   (f) The completed Schedules, and

   (g) The Contractor's Proposal

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 any defects therein, in conformity 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 and the remedying of defects therein, the Contract Price at the times and in the manner prescribed by the Contract.

In Witness whereof the parties hereto have caused this Agreement to be executed the day and year first before written in accordance with their respective laws.

SIGNED by: _____	SIGNED by: _____
for and on behalf of the Employer in the presence of	for and on behalf of the Contractor in the presence of
Witness: _____	Witness: _____
Name: _____	Name: _____
Address: _____	Address: _____
Date: _____	Date: _____

TENDER NO. 25/2017

PART D: EMPLOYER'S REQUIREMENTS

CONTENTS

1. SCOPE

This specification covers the requirements of Supply and Delivery of a 1000kW Containerised Generating Set complete with standard control panel. The supply shall include a 1250kVA, 415/22000V step-up transformer for the full operation of the unit at the power station.

2. TYPE OF PLANT

The engine shall be a Cummins Diesel engine having speed not exceeding 1500 RPM, four stroke cycle, in-line or Vee configuration and be designed for continuous operation on light fuel oil to BS 2869, class "A", under the following service conditions:

- Ambient Temperature 45 ºC
- Height above Sea Level (Altitude) 100 m
- Maximum Relative Humidity 100 %
- Minimum Relative Humidity 45 %

The diesel engine shall have proven records of at least three years satisfactory service as stationary generating unit under base load conditions and shall be currently in Production. Prototypes will not be accepted. The minimum full load rating of the plant at the designated site shall be according to the respective required rated capacity.

The step-up transformer shall be designed for outdoor use and is required to transform generated 415 volts to distribution system voltage of 22 kV. The generating set must be able to synchronise and share load with the existing generating sets in the Power Station.

3. PURPOSE OF PLANT

The diesel generating set is intended for continuous base load duty for power supply to the existing system. It is expected that the plant will be operated at, or near, its maximum continuous output for all or most of its operational life.

The plant offered must be capable of running in parallel with existing generating sets as base load units. The list of units installed in the Power Station is shown in table below.

Unit No.	Generator/Engine Controller	Engine/Make	Type/Model	Year of Manufacture
1	Power Command	Cummins	C1400 D5	2012
2	Heinsmen	Cummins	KTA50-G3	
3	PSG-Hydro/Mech	Caterpillar	3412	2013
4	2301A	Caterpillar	3512	2005
5	2301A	Caterpillar	3512	2013

The whole of the plant supplied shall be in every way suitable for the purpose herein described and shall be to the satisfaction of the Engineer.

4. DESIGN CRITERIA

The diesel generating set shall be designed so that it will function to achieve the purposes set out and inherent in the Specification.

The diesel generating set shall be capable of continuing to function after an earthquake measuring 7.3 on the Richter Scale.

The design shall be such that maintenance during the life of the plant shall be practically to a minimum and that maximum reliability shall be achieved under all conditions.

The plants shall be designed with due regard to the need for inspection, cleaning, repair and satisfactory operation under such variations of temperature, pressure and loading as may be met under working conditions from start up to shut down.

All equipment shall be either of weatherproof design or suitably protected such that the ingress of dust, grit, water or other foreign matter is prevented.

5. WORKMANSHIP AND MATERIALS

All materials shall be new and of best quality, shall comply with the appropriate standards and shall be entirely suitable for the service required. Adequate resistance to corrosion and erosion shall be incorporated.

The workmanship shall be of the highest quality throughout and all manufacture shall be to such tolerances as to ensure that similar parts of the plant including service parts are strictly interchangeable.

6. COMPLIANCE WITH STANDARDS

The conduct of the works, design and testing of the plant shall be in accordance with the current standards and codes of the Standards Association of Australia, and where no Australian Standard or Code exists, it shall comply with those of the British Standards Institute or the International Standards Organisation. The use of other Standard Codes shall be considered, but in any case shall be to the approval of the Engineer.

Where these standards or Codes conflict with the Specification, the Specification shall prevail.

Details of any change to the work required to comply with changes made to the Standards subsequent to the base date shall be submitted to the Engineer for approval.

7. CONTAINER REQUIREMENTS

7.1 General Arrangement

The generating set package shall comprise of a rigidly built 20 foot ISO Sea Container housing the alternator, control panel, engine, cooling system, fuel tank and the 24VDC batteries for starting and controls and all other required components and facilities to operate the generating set.

The container shall also be capable of anti-corrosion to withstand high humidity.

The container may be divided into two separate compartments; the larger compartment shall house the alternator and the control panel while the smaller compartment shall house a large surface area for the engine, cooling radiator, radiator fan and the fuel tank. Attenuators shall be placed out at hot air outlet and cooling air inlet.

The internal arrangement shall be such that, there shall be sufficient room to carry out maintenance work. The ceiling shall incorporate ceiling mounted internal supports for pulleys and bearings. There shall also be adequate lighting on either side of the engine and shall have a general purpose outlet for power tools and measuring instruments.

The Diesel Generating Set Package shall be capable of continuing to function after an earthquake measuring 7.3 on the Richter Scale.

The container shall have the following features:

- Welded steel construction
- Lifting forgings on all corners
- Inlet and outlet louvres on all sides
- Acoutically designed equipment with baffle plates
- Fully bunded fuel tank with 120% capacity
- Low fuel-level warning sensor in the fuel tank
- Silencer fitted with spark arrestor and rain cap
- Exhaust system fitted with insulation and heat shields
- Control panel mounted inside, viewable through glass door

7.2 Access

Two personnel doors shall be provided for easy access to generator compartment. These doors shall be lockable by padlocks during shipping.

Two emergency stop push buttons shall be provided to the right side of each personnel door and they shall be protected from damages while shipping.

A separate door shall be provided for access to radiator fan compartment either via generator set compartment or directly.

7.3 Lifting

Generating Set Package shall be able to be lifted by using any of the following;

1. Side lifter truck.
2. Crane by four corner castings on the roof of container.

7.4 Lighting

The Generating set package shall be provided with adequate lightings inside the container for night operation.

7.5 Noise

The container shall be sound proof to meet the requirement of noise emission of 80 dBA at 1 meter from the side of the container.

7.6 Paint Finish

Container base shall be grit blasted after fabrication and finished with Zinc rich Primer and 2 pack epoxy enamel, all other parts shall be finished with 2 pack epoxy enamel.

7.7 Weather Protection

This generating set package shall be fully weather protected against a hot sun, sand, dust, wind and rain.

8. DIESEL ENGINE

8.1 Skid Base

A rigid design all welded mild steel skid base accommodating the engine and alternator is required. The base design shall:

(a) Incorporate four lifting point attachments.

(b) Incorporate suitable towing attachments.

(c) Permit an oil drip tray to be slipped under the engine.

(d) Allow easy access to engine and alternator for maintenance purposes.

Suitable resilient mounts shall be installed, preferably between the skid base and the engine/alternator to withstand conditions specified in Section 3.4. Suitable foundation bolts and "Loxins" for container floor mounting of the unit shall be supplied.

Any deviation from the Specification shall be submitted with the tender documents for the Engineers approval.

8.2 Engine - General

The diesel engine shall:

(a) The engine shall be naturally aspirated or turbocharged, four stroke, inline or Vee configuration and of robust construction.

(b) The engine shall be fitted with adequate heavy duty fuel and standard air cleaner with easily changed filter elements.

(c) A thermostat shall be fitted in the cooling system to maintain the coolant at its optimum operating temperature.

(d) The engine shall be directly coupled to the alternator via a SAE type coupling.

(e) The set shall have battery starting facilities with provision for air starting if required.

(f) The engine is to be fitted with guards on all external rotating apparatus and engine mounted exhausts manifolds to obviate serious injury to operating and maintenance personnel.

(g) A set of tools sufficient to carry out running maintenance and a list of special tools necessary for major engine overhauls shall be supplied as part of the contract and the price included in the Bid Price.

(h) Six (6) complete changes of spare elements for each type of filter fitted on the engine shall be provided for **each** engine.

8.3 Governor

Governing shall comply with the requirements of BS 5514 Class A2. The governor shall be fitted with a 24 VDC shutdown solenoid, ENERGISED TO RUN and provided with a latching mechanism.

Electronic governing shall be of Woodward or Heinzmann manufacture. Governors similar to the Heinzmann Si-Tec Total Generation Control will be given preference. The electronic governor controller complete with the remote speed adjustment potentiometer shall be installed in the remote control switchboard and the actuator on the generating set.

The Contractor shall provide adequate length of shielded cable for the actuator feedback and the speed magnetic pick-up unit on the engine to the controller in the control panel.

The set shall be capable of running in parallel at synchronous speed with the existing gensets.

In addition, the adjustment of the governor shall be possible manually while the engine is running independent of the remote control equipment.

All wiring shall be terminated in the engine wiring terminal box except for the actuator feedback and the speed magnetic pick-up unit which shall be unjointed.

8.4 Lubricating Oil System

The engine shall be fitted with duplex lubricating oil filters. The filter assembly arrangement and position shall be such that filter elements can be accessed and changed easily.

A suitably sized glacier filter shall be fitted on the engine.

The engine sump shall have a draining duct from the lowest point, extended to enable the engine lubricating oil to be drained into a receptacle outside the sub-frame of the unit, with the unit standing directly on the container floor.

8.5 Engine Cooling System

Cooling of the engine shall be by water or the engine manufacture's standard coolant. The circulating pump shall be engine driven either by multiple Vee belts or gear shaft arrangements. The pump shall be designed to effectively circulate the coolant through the system.

Engine Cooling water radiator shall be of engine mounted, vertical type large surface area radiator, cooled by suction draft or by forced draft and shall be protected from damages while shipping.

Generator Compartment shall be provided with adequate ventilation and cooling air for Engine/Alternator. This air shall be drawn through filters to avoid dust getting into the generating set compartment.

8.6 Exhaust Silencer

The engine shall be supplied with an efficient residential type silencer with suitable flexible bellows and a pre-fabricated silencer discharge pipe.

The silencer shall be of the side entry and side exit type for horizontal installation.

A spark arrester exhaust silencer shall be mounted immediately above the engine and shall be properly insulated and covered to form part of the roof.

8.8 Fuel System

The engines fuel supply lines shall be so arranged that the station supply can be connected to each particular engine at the free end of each individual skid base.

The Contractor shall provide return tanks if any engine is provided with a negative head engine suction pump and/or if unused fuel is returned from the engine. The minimum requirements on the tank shall include:

(a) A top opening with flanged bolt-on cover, large enough for inspection, float valve replacement and cleaning purposes.

(b) A vent. The vent fitting shall be such that it can be extended without welding.

(c) An inlet from the main station bus rail. The inlet shall be fitted with a heavy-duty float valve.

(d) An outlet to the engine, including flexible connections.

(e) An inlet from the engine return, including flexible connections.

(f) A drain completes with a valve and plug.

(g) A tubular level indicator

All fuel connections to and from the return tank, vent and tubular level indicator mounting shall be of screw on type.

A tubular level indicator shall be installed on each return tank. The level sight shall have a minimum diameter of 15mm. It shall be made of glass and shall have both a transparent protective cover and anti-spill isolating valves at each end.

Combined fuel meters for totalising and flow shall be supplied under this contract and calibrated in S.I units (flow rate in litres/*unit time*) respectively. Each meter shall be designed to measure only the fuel consumed by the engines. Where there is a return line to the return tank from the engine, a meter shall be installed on both outlet and inlet to return tank each between the generator and the return tank.

Where the meters are powered electrically, a backup power supply for memory retaining functions shall also be provided in case the primary power supply is isolated. The preferred location for the meters, if electrical shall be on the engine mounted instrument panel.

8.9 Engine Starting

The engine shall be electrically started by means of starter motors. The motor shall be 24 VDC and starting on batteries of sufficient capacity to provide one and a half minutes total cranking time without recharging and shall be rated at not less than 170 ampere-hours.

The starter motor and start solenoid assembly shall be provided with a negative terminal for cable connection to the starting battery. Negative return via the earthed engine frame is not acceptable as the starting batteries are to be isolated from earth.

A suitable battery charger shall be provided for charging the starting batteries. An engine driven battery charger is not required.

Starting batteries, cables, clamps and battery trays shall be provided by the Contractor. Battery trays shall be supplied with the legs insulated from earth.

8.10 Safety Devices

The engine mounted device wirings shall be terminated in a terminal box mounted on the engine.

8.10.1 Overspeed

An electrical overspeed trip device shall be provided for the engine. This shall operate independently from all other safety devices.

A separate manual reset, mechanically operated overspeed trip device may also be provided. This shall also operate independently from all other safety devices. The reset mechanism shall be located such that adjacent parts will not be dismantled for resetting.

Operation of ANY overspeed device shall initiate a contact to open the unit circuit breaker. The device shall be rated for use with 24 VDC relays to be provided by the Contractor.

8.10.2 Overcrank

An overcrank switch suitable for a 15 seconds single cranking cycle limit with lockout shall be fitted. An alarm contact shall be provided and terminated in the engine auxiliary wiring terminal box for overcrank alarm indication at the control panel alarm annunciator.

8.10.3 Pressure and Temperature Sensing Devices and Spare Thermowells

(a) Pressure sensors/transmitters and temperature sensors/RTD devices shall be fitted on the plant and shall be suitable for the following functions: -

- Lubricating oil pressure metering, data logging and low alarm.
- Lubricating oil temperature metering, data logging and high alarm.
- Jacket coolant temperature metering, data logging and high alarm.

(b) Pressure and temperature switches shall be fitted for the following trip functions: -

- Lubricating oil pressure critically low.

- Lubricating oil temperature critically high.
- Jacket coolant temperature critically high.

Each function/condition shall be operated by a separate safety device. Initiation of any trip devices shall also trip the circuit breaker and the engine. All devices and switches shall be rated for use with 24 VDC relays.

All thermometer probes shall be installed in stainless steel pockets. The pressure switches shall be installed with isolating valves and provided with an extra fitting for testing of the switches in-situ.

The devices shall be installed in a location that is easily accessible and away from excessive heat and vibration that may cause them some damage.

8.10.4 Emergency Stop Button

Standard self-latching emergency stop push-buttons shall be fitted on the engine mounted instrument panel and the unit control panel.

Initiation of any of these stop push-buttons shall operate the governor shut-down solenoid and trip the unit circuit breaker.

Clear hinged plastic covers shall be installed on all emergency stop push-buttons to prevent accidental operation of these push-buttons.

8.11 Engine Mounted Instrument Panel

The engine mounted instrument panel shall be mounted in such a position that it is clearly visible from the engine starting position. The panel shall be resiliently mounted in such a way that it will not be subjected to undue engine vibrations. The following gauges shall be fitted on the instrument panel:

(i) Tachometer.

(ii) Lubricating oil pressure gauge.

(iii) Lubricating oil filter differential gauge

(iv) Lubricating oil temperature gauge.

(v) Fuel pressure gauge.

(vi) Fuel filter differential gauge.

(vii) Water temperature gauge.

(viii) Pyrometers for exhaust gas.

(ix) Fuel totalising and flow meter.

All gauges shall be of the dial type, 63 mm minimum diameter. Temperature and pressure gauges shall be marked in degree Celsius and kilopascals respectively.

All thermometer probes shall be installed in stainless steel pockets.

All instruments shall indicate the normal operating condition at two-thirds full scale deflection on the engines maximum continuous rating.

The Contractor shall mark on the pressure gauges the normal operating pressure ranges.

8.12 Nameplates and Labels

All items of equipment and control shall be identified by nameplates and labels.

The nameplates and labels shall be:

- Clearly legible.
- In the English language.
- In S.I. units.

The nameplates and labels shall be of engraved plastic with black characters on a white face, or brass material with engraved characters. The nameplates shall be secured by screws, glued-on type nameplates and labels will not be accepted.

All labels shall be clearly visible from floor level.

8.13 Miscellaneous

(a) Engine Wiring

All the wiring of the engine protection devices on the engine shall be in metallic conduit and securely fixed to the engine. Unsheathed single insulated wiring will not be accepted. The wiring shall terminate in a suitable terminal box on the engine incorporating a numbered terminal strip corresponding to a terminal strip in the switchboard.

The engine wiring terminal box shall be separate from the engine instrument panel.

(b) Internal Protection

The Contractor shall circulate a charge of rust inhibitor through the lubricating oil, jacket cooling and fuel system prior to the unit leaving the factory. All exposed metal parts shall be given a coat of approved anti-rust preservative.

(c) Gaskets, Bolts, Nuts and Washers

The Contractor shall supply all the gaskets, bolts, nuts and washers for the support stands, brackets and matching flanges supplied for the fabrication and installation of the exhaust ducting.

9. ALTERNATOR

The alternator shall conform to Australian Standard AS 1359 and be suitably rated at 1000kW, 3 phase, 0.8 PF Lagging, 415 V, 4 wires, 50 Hz, 1500 RPM. The alternator shall be capable of delivering rated output at rated power factor.

The alternator shall be housed in screen protected drip proof enclosure with an IP 23 Protection and Class “H” insulation.

The site rating for the generator shall be taken as 90% of the Class 'H' nameplate prime rating of the engine.

9.1 Excitation System

The alternator shall be of brushless type, excited via a permanent magnet generator, self-regulating, capable of withstanding 10% overload at full rated voltage and 0.8 power factor lagging for a period of one (1) hour in every 12 hours of continuous running.

The alternator shall be capable of operating in parallel with other machines at synchronous speeds and shall be provided with an external, motorised voltage adjustment facility with Auto / Manual selection. This shall allow adjustment of the alternator terminal voltage over a range of +/- 5% of nominal, with the frequency remaining at 50 Hz.

The alternator shall be provided with anti-condensation heaters to prevent moisture formation when the set is not generating.

10. CONTROL PANEL

The control panel shall be located inside the acoustic enclosure and suitable for operation in conjunction with the 1000 kW generating set. The panel shall be of robust construction and completely enclosed in steel sheeting in such a way as to prevent entry of insects, snakes and dust and shall have hinged, lockable, rubber sealed panel doors for front access.

A suitably designed generator controller shall also be mounted on the panel and perform the following functions:

- Control, protection and monitoring of the generator
- Synchronization, paralleling and load sharing
- Other functions as required on standard controllers

The control panel shall include batteries and battery charger required for control, protection and monitoring of the generator.

11. STEP-UP TRANSFORMER

11.1 Design

The transformer shall be fitted with an enclosed, air-insulated cable-box for the low voltage (415V) winding connections while the high voltage (22kV) and the neutral winding connections shall be brought out to insulated open bushings at the top.

11.2 Voltage Ratios and Tapping

The low voltage (LV) winding shall be connected in Delta configuration and the high voltage (HV) windings connected in Star configuration with the Neutral Star Point brought out to the neutral point terminal bushing to allow cable connection to the switch-yard earthing system.

Tap Position Selector Switch

A five-position Tapping Selector Switch shall be provided. This switch shall permit off-load adjustment of the transformer voltage ratio.

The tapping selector mechanism controlled by this switch shall act upon both high voltage windings, adjusting their voltage ratios by the same percentages.

The switch shall be mounted externally on the transformer tank and shall be of a robust, heavy duty rotary design, padlocks in all positions and suitably weatherproofed.

Percentage Tapping

The Tapping Position Numbers and their corresponding percentages of nominal voltages and voltage ratios shall be:

Tap No.	Tap %	HV	LV	
1	+5.0 (105.0)	22,550	415	
2	+2.5 (102.5)	22,275	415	
3	0.0 (100.0)	22,000	415	(Nominal or Principal Tap)
4	-2.5 (97.5)	21,725	415	
5	-5.0 (95.0)	21,450	415	

11.3 General Specifications

Description	**Requirement**
Transformer type	Step-up
Continuous Rating	1250 kVA (on all tapping)
Type of Cooling	ONAN
Number of Phase	Three (3)
Frequency	50 Hz
HV Volts (Nominal)	22,000V
L.V Volts	415 Volts
Connection Symbol	YNd11
% Impedance voltage	4.0% → 5.0%
Top Oil Temperature Rise	60°C or less
Winding Temperature Rise	65°C or less